

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA
OAKLAND DIVISION

EPIC GAMES, INC.,)	Case No. 4:20-cv-05640-YGR-TSH
)	
Plaintiff, Counter-defendant,)	REBUTTAL WRITTEN DIRECT
)	TESTIMONY OF MICHAEL I. CRAGG,
v)	PH.D.
)	
)	The Honorable Yvonne Gonzalez Rogers
)	
APPLE INC.,)	Trial: May 3, 2021
)	
Defendant, Counterclaimant.)	Ex. Expert 13
)	

REBUTTAL WRITTEN DIRECT TESTIMONY
OF MICHAEL I. CRAGG, PH.D.

CASE No. 4:20-cv-05640-YGR-TSH

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I. Qualifications and Assignment

1. I am a Principal of The Brattle Group, a global economic consulting firm. I have a Ph.D. in economics from Stanford University, an M.A. in economics from the University of British Columbia, and a B.S.E. from Princeton University.

2. I have been researching, studying, and publishing on competition economics and industrial organization matters for over 30 years. I have spoken at various conferences on competition issues and platform economics, including on antitrust analysis of platforms following the Supreme Court's *American Express* decision (alongside Dr. Evans and Prof. Schmalensee).

3. I have been recognized by Who's Who and GCR as a leading competition expert. I have taught at Columbia University and UCLA's Anderson School of Management. I served on the faculty of the World Bank Training Programs, held a NIH Fellowship at RAND, and was a senior research economist at the Milken Institute in Santa Monica, CA.

4. I was asked by Epic to review the opinions of Professors Hitt, Schmalensee, Lafontaine, and Hanssens (collectively "Apple's Experts") and analyze, from an economic perspective, their definition of an antitrust market for digital game transactions which, they contend, spans all platforms on which digital game transactions might be executed.

II. Summary of Opinions

5. For the sake of brevity, I provide opinions on only some of the analyses and opinions offered by Apple's Experts. My choice to focus on some opinions but not others does not mean that I agree with any of their opinions; I generally do not. The opinions I have formed are:

6. **Opinion 1.** The antitrust market that Apple's Experts define does not include non-game iOS apps and thus fails to address the full scope of the conduct at issue, as both the allegations set forth in the complaint and the products Epic distributes extend beyond games. Apple's Experts fail to perform any standard market definition exercise, such as a Hypothetical Monopolist Test, instead simply assuming their proposed antitrust market to be correct. Thus, any analysis of market power and anticompetitive effects in the market Apple's Experts have defined is uninformative. (Section III, pp. 3-4.)

7. **Opinion 2.** My empirical analysis of Fortnite playtime shows that Fortnite users regard game play on mobile devices as distinct from – and not a substitute for – game play on non-mobile devices. (Section IV.A, pp. 5-8.)

8. **Opinion 3.** Most of Apple's Experts' purported evidence of substitutability between game platforms, including Prof. Hanssens's survey results, is largely irrelevant, because

it merely addresses platform *access* (or *play*) rather than substitutability. (Section IV.B, pp. 12-15.)

9. **Opinion 4.** The few analyses that do address substitution do not support substitutability of game transactions. Specifically,

- Prof. Hitt’s iOS “console app” analysis relies on an unproven proxy for console purchase and its results look at the wrong metric, namely the rate of growth. Correcting the analysis to measure dollars spent, the results are reversed. (Section IV.C, p. 16.)
- Prof. Hitt’s analysis of the release of Fortnite on the Nintendo Switch (“Switch”) shows incremental use of Fortnite across platforms, not substitution across platforms; here, too, Prof. Hitt presents his results in a misleading way. Correcting the presentation to reflect the correct metric reverses the result. (Section IV.C, pp. 19-20.)
- Prof. Hitt’s Spotify analysis cannot support Apple’s games transaction market because Spotify is not a game, it is subject to uniquely lenient Apple policies that do not apply to most apps (and do not apply to any game apps), and its monetization does not involve the recurring in-app purchases typically used in games and many other apps. Moreover, the data Prof. Hitt analyzes actually shows that [REDACTED]
[REDACTED]
(Section IV.C, pp. 22-25.)
- Prof. Hitt’s Netflix analysis provides no information on the use of Netflix on iOS whatsoever. And like Spotify, Netflix is not a game, is subject to the same unique Apple policies that apply to Spotify, and its monetization does not involve recurring in-app purchases. (Section IV.C, p. 25.)

10. **Opinion 5.** Consumers and app developers use platforms in distinct ways, based in part on their technological differences. Yet with the exception of Prof. Hitt’s flawed analyses discussed above, platform *usage* is a topic that Apple’s Experts largely ignore. (Section IV.D, pp. 26-39.)

11. **Opinion 6.** Developers are highly dependent on App Store revenue, and Apple has significantly more bargaining leverage than any individual developer. As such, Apple’s Experts are wrong to claim that developers can switch in sufficient numbers to serve as a competitive constraint on Apple. (Section IV.E, pp. 37-39.)

12. **Opinion 7.** Apple has significant market power in the market for app distribution. Prof. Hitt’s claim that effective commissions have dramatically declined is based on flawed assumptions and is incorrect. Moreover, the data shows that Apple’s per-transaction fees have dramatically increased, and that Apple extracts an ever *increasing* share of App Store revenues, while developers’ share of that revenue has declined over time. (Section V, pp. 40-47.)

III. Apple's Experts' Proposed Market is Too Narrow because it Focuses on Game Apps to the Exclusion of Other Apps

13. The role of market definition in economic analysis of antitrust issues is instrumental: “[a]lthough market power and market definition have a role in antitrust analysis, their proper roles are as parts of and in reference to the primary evaluation of the alleged anticompetitive conduct and its likely market effects.”¹

14. Rather than begin their analysis with the allegations in the complaint, which define the conduct at issue, Apple's Experts focus their market definition on games, based on a myopic focus on only one of Epic's roles – developing games – and on only one Epic product – Fortnite. That approach is incorrect for at least three reasons.

15. *First*, this approach fails to acknowledge that the allegations in the complaint do not focus on games, or on conduct by Apple that is unique to games. The restrictions Apple imposes on distribution of iOS apps outside the App Store and its requirement that developers use Apple's IAP payment solution for all in-app purchases of digital content apply equally to all apps – games, magazines, streaming services, dating services, exercise apps, photography apps, etc.

16. *Second*, this approach fails to recognize Epic's role as a would-be competitor in the distribution of apps. Apple's Experts ignore Epic's allegations that Apple's conduct is depriving Epic of the opportunity to compete with the App Store in distribution of iOS apps through rules that apply to any competing iOS app distributor, regardless of the genre of apps it seeks to distribute.

17. *Third*, this approach ignores the fact that Epic also develops non-game apps, including Houseparty, a social networking app, and several apps for developers utilizing Epic's *Unreal Engine*. Apple's Experts failed to consider any of these apps, and as a result, defined a market that does not include them. That is a fundamental error; Apple's Experts acknowledge that the relevant market *must* include the products at issue – yet theirs does not.

18. Apple's Experts also did not utilize the standard economic methodology for defining a market. The standard technique for defining the relevant market is the hypothetical monopolist test (“HMT”), one common articulation of which can be found in the Department of Justice's and the Federal Trade Commission's Horizontal Merger Guidelines. This test considers whether a hypothetical monopolist that controlled a relevant set of substitute products could profitably impose a small but significant and non-transitory increase in price, or “SSNIP.” A SSNIP is typically defined as a price increase of 5-10%. The insight of the HMT is that a monopolist could only raise prices profitably if the products in the relevant market had insufficient demand-side substitutes *outside* of that market. If substitutes exist such that enough

¹ Salop, Steve (2000), “The First Principles Approach to Antitrust, *Kodak*, and Antitrust at the Millennium,” *The Antitrust Law Journal*, 68, 187-202, p. 188.

customers would substitute away from the products offered by the hypothetical monopolist, rendering the price increase unprofitable, then the relevant market should be expanded to include these other products because they are meaningful substitutes that constrain the hypothetical monopolist.

19. In the context of this matter, the preliminary question begins by asking whether supra-competitive pricing of iOS app distribution services (or iOS game transactions, to use Apple's Experts' proposed perspective) would lead to enough substitution to other platforms by developers, consumers, or some mix thereof, such that this supra-competitive pricing would be unprofitable for Apple. The validity of this question and of the HMT is undisputed. However, Apple's Experts do not follow this standard methodology.

20. Without applying the HMT at all, Apple's Experts assert a market that is both too narrow (as discussed in this section) and too broad (as I discuss in the next section). The market they propose is too narrow because Prof. Lafontaine simply asserts a supposedly "intuitive" distinction between game apps and all apps, without performing any actual economic analysis to support that distinction. Specifically, Prof. Lafontaine claims game transactions are "distinct," relying on Prof. Hitt's analysis of competitive conditions and the concepts of the *Staples/Office Depot* decision (Lafontaine, ¶27). However, neither she nor Prof. Hitt point to evidence showing that the competitive conditions for the *distribution* of game iOS Apps are meaningfully different from the competitive conditions for the distribution of non-game iOS apps.

21. The direct way to answer the Court's question and test whether the distribution of games and the distribution of non-games are in the same market is to imagine separate distribution channels for each, and apply a SSNIP test to the game distribution channel. Specifically, consider a monopolist of game app distribution, including iOS game app distribution, versus a monopolist of general-purpose app distribution (that may distribute games too, as the App Store does). It is simply unreasonable to assume that the game app monopolist could profitably impose a SSNIP under these circumstances, as we know from experience that the App Store, as a general store, has no difficulty distributing game apps alongside other apps. We would therefore expect a general store like the App Store to constrain the market power of a hypothetical monopolist in iOS game app distribution. Apple's Experts do not identify any reason (let alone evidence) to suggest otherwise.

22. To try to distinguish games from other apps Prof. Hitt offers data showing differences in the mix of transactions across app genres (Hitt, Figures 32-35, ¶¶123-128). However, all of these transactions are processed through the same general store, utilizing the same technology, generally subject to the same rules. The differences Prof. Hitt points to do not show that game app *distribution* is materially different from non-game app *distribution*. The different monetization strategies across these genres do not provide means for a hypothetical monopolist of the distribution for any one specific genre of apps to profitably impose a SSNIP.

23. Profs. Lafontaine and Hitt also claim that games and non-game apps are distinct

because games can be distributed on game consoles while other apps cannot, and thus game apps have more distribution channels than do other apps. I discuss separately below why other platforms, such as consoles, are not reasonable substitutes for mobile platforms for the distribution of any apps, and are therefore irrelevant to the analysis. Regardless, this claim is plainly incorrect – many iOS games are available only on mobile platforms; Prof. Hitt’s own data shows that only a sliver of all iOS games are actually available on consoles (Hitt, Figure 3). Conversely, many popular non-game apps, such as video and music streaming apps, for example, *are* available on consoles. Ultimately, Apple’s Experts did not show that game apps, on average, are available on more platforms than other apps – let alone analyze whether this would affect the competitive dynamics of a hypothetical monopolist in a sub-genre of app, as discussed above.

IV. Apple’s Experts’ Proposed Market is Too Narrow Because Game Transactions on Smartphones, Game Consoles and PCs Are Not Economic Substitutes

24. As noted above, the central question in defining a market is one of substitutability. That is, what products (if any) would consumers turn to if faced with worsening terms, such as higher prices or lower quality? The market suggested by Apple’s Experts is too broad because it proposes substitutability among platforms without pointing to any evidence of actual, meaningful substitution of users between them. In other words, it assumes that if Apple raised the price of app distribution services on iOS, meaningful numbers of users of iOS game apps would react by switching their game play and/or in-game transactions to other platforms, such as PCs and consoles. That conclusion is not only unsupported by the evidence Apple’s Experts, and specifically Prof. Hitt, present – the record evidence refutes it. Below, I show several analyses of available data, all of which suggest that non-iOS platforms are not reasonable substitutes to iOS for game apps.

A. Empirical Evidence Shows That Different Platforms Are Used Incrementally, Rather Than as Substitutes

25. I examine the potential substitutability among the platforms identified by Apple’s Experts by performing an empirical analysis of data on consumers who use these different platforms. Because Fortnite is free to play for users and in-game purchases are optional, I measure substitutability through the time spent playing Fortnite on a platform.

26. I begin the analysis with Figure 1, below, which provides statistics on U.S.-based Fortnite players. As the Figure shows, iOS devices, PlayStation 4, and Xbox One are the most popular platforms by size of the player base. However, comparing the platform usage – measured by the average minutes per week by platform – iOS falls well behind these other platforms. On average, console Fortnite players play five to seven times as many minutes per week (245.31-318.77 minutes) as do iOS Fortnite players (47.37 minutes). A similar pattern emerges when comparing total in-app purchase revenue – consoles generate four to eight times the revenue that iOS devices do, on a per-player basis. The relationship between playtime and revenue can be measured by calculating the “correlation coefficient” between these two

variables. Specifically, the correlation coefficient between monthly game play by platform and monthly revenue by platform is equal to 0.65, indicating a strong positive correlation between these variables.² This shows that generally, players who play more time on a platform tend to spend more money on that platform, suggesting that users tend to transact on the same platform on which they play the game and vice versa – users tend not to leave their platform of choice to conduct transactions elsewhere.

**FIGURE 1: SUMMARY STATISTICS OF
US FORTNITE PLAYERS BY PLATFORM**

Platform	Avg. Minutes/Week	By Primary Platform		Multi-Platform Users	
		Players (Thousands)	Avg. Revenue	% of Weeks Platform Was Not Used	% of Weeks Platform Was Most Played
iOS	47.37	1,907	\$12.14	80.9%	10.0%
Android	26.85	184	\$6.62	89.6%	4.5%
Windows	88.37	709	\$51.05	64.7%	30.1%
MacOS	23.75	39	\$8.78	92.3%	4.6%
PlayStation 4	318.77	1,861	\$97.64	19.0%	77.9%
Xbox One	245.31	1,717	\$94.12	25.1%	71.2%
Switch	256.43	525	\$52.26	52.7%	39.2%

Source: PX-1045.

27. Figure 1 also compares the subpopulation of users who have played Fortnite across multiple devices. The fourth column shows the portion of weeks that a multi-platform user did *not* play on the specific device. For example, the first row of this fourth column shows that multi-platform users who play on iOS (among other platforms) did not play on iOS in 80.9% of weeks (and so did play on iOS in only 19.1% of weeks). On the other hand, multi-platform users more rarely have weeks in which they do not play on consoles. For example, the PlayStation 4 and Xbox One rows show that multi-platform users on these consoles do *not* use those platforms in only 19.0% and 25.1% of weeks, respectively (and therefore do play on those consoles in 81% and 74.9% of weeks, respectively). The rightmost column shows that multi-platform users tend to use their consoles (and in particular PlayStation and Xbox) significantly more than any other platform. As shown in Figure 1, Sony and Microsoft consoles are the most-used platforms for multi-platform users in over 70% of weeks. This is further evidence that the ways in which iOS devices and console devices are used for playing games are distinct – and, as a result, that they are not substitutes.

² The “correlation coefficient” is a standardized measure of how closely an increase in one variable is associated with an increase (or decrease) in another variable. The correlation coefficient always lies between -1 and 1, with a correlation of -1 indicating a perfect negative correlation (when one variable increases, the other decreases) and a correlation of 1 indicating a perfect positive correlation (when one variable increases, the other also increases). See PX-1022 and PX-1023 for game play and revenue data by platform.

28. Next, I performed two sets of regression models designed to study changes in Fortnite play patterns when users begin playing on a new device. My first analysis studies the effect on total Fortnite playtime when a user begins playing on a second device. For the purposes of this analysis only, I organize devices into one of four categories: (1) mobile devices (iOS or Android), (2) the Switch, (3) home consoles (PlayStation or Xbox) and (4) PCs (Windows or MacOS). My analysis studies the effect of a user beginning to play on a second device after having already played Fortnite on another device.

29. My results are shown in Figure 2, where “+” indicates a statistically significant *increase* in total playtime when adding a second platform and “--” indicates no statistically significant change in total playtime. I observe 15 original-device/second-device combinations. For 13 of those combinations, I find a statistically significant increase in total playtime when the user begins playing on a second device. When users add a device, they play Fortnite more. That means that play on an additional platform leads to distinct, incremental use, separate from play on the original device, rather than substitution of play time among the different platforms.

FIGURE 2: STATISTICAL TEST FOR A CHANGE IN PLAY TIME ASSOCIATED WITH A SECOND GAME PLAYING PLATFORM

		<u>Original Platform</u>			
		Mobile Device	Switch	Home Console	PC
<u>User Adds a Second Platform</u>	Mobile Device	+	+	+	+
	Switch	+		+	+
	Home Console	+	+	--	+
	PC	+	--	+	+

Source: PX-1024.

30. Next, I perform an additional set of regressions similar to the above analysis, except this time I studied only the change in playtime *on the original device* once a user begins playing on a second device. Figure 3 shows the results of the statistical tests demonstrating whether mobile devices, Switch, PCs, and home consoles are substitutes. Specifically, I test how playtime on the users’ first device changed when they add a second device. There could be three potential results of this analysis.

- *First*, a statistically significant increase in playtime on the first device would be consistent with complementarity between the platforms, because adding a second device leads to an increase in playtime on the original device.
- *Second*, a statistically significant decrease in playtime on the first device would be consistent with substitution, because the user is playing less on the first device now that they have a second, which is the switching behavior that is at the heart of the relevant market inquiry.

- *Third*, no statistically significant change in playtime on the first device would suggest that users' demand for game play on the two platforms addresses a demand that is separate and unrelated to the demand satisfied by play on the first device.

31. Thus, the *first* or *third* cases are empirical evidence that the platforms are not in the same market because users do not substitute one platform for another. Figure 3 shows these results: "C" indicates statistically significant complementarity between platforms, "S" indicates statistically significant substitutability, and "--" a statistically insignificant result.

FIGURE 3: STATISTICAL TEST FOR COMPLEMENTARY AND SUBSTITUTE GAME PLAYING PLATFORMS

		<u>Original Platform</u>			
		Mobile Device	Switch	Home Console	PC
<u>User Adds a Second Platform</u>	Mobile Device	C	C	C	C
	Switch	--		--	--
	Home Console	--	S	S	S
	PC	C	--	--	--

Source: PX-1027.

32. Figure 3 shows that mobile devices tend to be associated with complementary game play – a user who already plays Fortnite on a home console, PC, Switch, or mobile device, and then begins playing Fortnite on a mobile device (or on a second mobile device), increases their play time on the original device.³ This result is not surprising. Smartphones are inherently different from PCs and consoles. Games can be played on a smartphone virtually anywhere, but its small screen and limited hardware are not optimized for playing graphically intensive games. Thus, a smartphone cannot be a good substitute for an available higher-end platform optimized for playing games, and this empirical analysis supports that observation.

33. Similarly, as we would expect, home consoles tend to be substitutes for other non-mobile platforms including rival consoles and PCs – but not for smartphones, which can be used outside of the home in many places a console *cannot* be used. That is, when a console user adds a second console they play less on the first (which makes sense, because there are only so many "home" or "wired" hours available for playing games). The same is true when a Switch user adds a home game console – they substitute hours from their Switch to their new home

³ Note that, in this analysis, tablets are considered mobile devices. Thus, mobile device users who begin playing on a second mobile device may be users who were initially playing on a smartphone, and subsequently began playing on a tablet as well.

console.

B. Most of Apple's Experts' Analyses Do Not Even Purport to Demonstrate Actual Substitution

1. Developers Do Not View Different Platforms as Competitively Sufficient Substitutes

34. Prof. Hitt presents several analyses, on which Prof. Lafontaine relies (Lafontaine, ¶¶26-27), showing that developers *use* multiple platforms to publish games (Hitt, Sections III.A, III.B, III.C, and III.D). Prof. Hitt says this analysis “strongly support[s]” his overarching conclusion that “[f]rom the perspectives of both developers and consumers, the App Store is a substitute for, and competes with, other digital game transaction platforms” (Opinion 1). However, *use* of a platform is simply not sufficient to show competitively meaningful *substitution* between platforms, such that one can use such evidence to properly define a relevant market. Prof. Hitt lays out four main arguments, but all are unsupported by the evidence he presents. Rather, his evidence is more consistent with the conclusion that the different platforms are distinct distribution channels from the point of view of developers, and should accordingly be in distinct markets separate from the Apple App Store.

35. *First*, Prof. Hitt argues that “[g]ame developers have the option to make transactions through many platforms besides the App Store” (Hitt, Section III.A.) His only support for this assertion is that there exist several platforms or stores on which game transactions are offered, and developers could choose to develop versions of their games to allow transactions on multiple platforms or stores (Hitt, Figure 1, ¶¶24-26). But the data presented by Prof. Hitt suggests the opposite conclusion: that developers must develop games for each specific platform to reach discrete sets of users that they cannot reach otherwise. There would be no need for developers to offer games through multiple distribution channels if each platform was a good substitute for other platforms. If this were the case, by distributing games only through one platform, developers could reach all or most users, yet would not incur the substantial costs associated with platform-specific development and maintenance of their app. Moreover, if developers like Epic could unilaterally shift transactions from one distribution platform to another, they would do so, because developers enjoy a more favorable revenue split on storefronts like the Epic Games Store than they do on iOS. The fact that developers nonetheless distribute through the App Store and bear the much higher commissions collected by Apple is strong evidence that they cannot switch their transactions elsewhere.

36. *Second*, Prof. Hitt states that “[m]any game developers choose to use multiple transaction platforms to make game transactions with consumers for a single game” (Hitt, Section III.B). Prof. Hitt cites two facts in support: (1) there is high overlap for the top 25 games between iOS and other platforms (especially Android) (Hitt, Figures 2-3, ¶¶30-31) and (2) popular games like Minecraft, Roblox, and Fortnite are available on many platforms (Hitt, Figures 4-6, ¶¶32-38). Neither fact supports his overarching opinion on substitution.

37. Here too, Prof. Hitt neglects the fact that developers who choose to distribute their apps on multiple platforms are actually targeting discrete sets of users, with different use characteristics across platforms. For instance, developers do not consider the choice between the Apple App Store and Google Play as alternatives through which they can reach the same users. Developers spend effort to evaluate each platform specifically because they recognize that by developing for one platform, but not another, they are choosing to address the demand of one distinct set of users and uses, while foregoing others. Prof. Hitt does nothing to address that point – and most importantly does not establish high cross-use ownership of devices *for the same use*, which is the salient question here.

38. Further, Prof. Hitt’s own analysis shows minimal overlap in game titles between iOS and consoles. By his own analysis, only 12-16% of the top 25 iOS apps are available on *any* console (Hitt, Figure 3). His finding that nearly all popular iOS apps are also on Android is unsurprising, as it is consistent with the separate groups of mobile users (iOS versus Android users), that each accesses. Finally, his finding of extensive overlap with PCs overstates this overlap in several important ways.

- Prof. Hitt considers iOS games to be “available” elsewhere even when the mobile version of the game is different from the console or PC version of the game. For example, Prof. Hitt considers the free-to-play mobile game “PUBG Mobile” to be available on PC and consoles that support the non-mobile, paid game “PUBG.” However, Prof. Hitt’s PUBG citation does *not* list iOS devices on the list of platforms supported by the game.⁴ As another of Prof. Hitt’s sources explains, if “mobile players with fiddly touch controls” had to play PUBG with PC players, they would “hardly stand a chance.”⁵ As such, Hitt overstates the overlap in common titles between iOS and PCs.
- Many of the articles Prof. Hitt relies on to assert that particular mobile games can be played on PC require the user to “emulate” a smartphone on their computer. That is, to run a piece of software that gives a PC similar functionality as a smartphone. This allows the user to operate the mobile game app only inside of this “smartphone emulator” – of course without the mobility and flexibility of a smartphone. Other articles Prof. Hitt relies on require equally onerous alternatives, such as following an *eleven-step* procedure to play the mobile app “Wordscapes” online.⁶ These options are a

⁴ The “Support” tab on pubg.com lists four platforms on which the game is supported. iOS is not included in this list.

⁵ Lawver, Bryan, “PUBG cross-platform support: Everything we know,” digitaltrends, September 22, 2020, available at <https://www.digitaltrends.com/gaming/pubg-cross-platform-play-support/> (last accessed April 25, 2021).

⁶ Kwan, Michael, “Where to Play Wordscapes Online (No Download),” WordFinder, August 14, 2020, available at <https://wordfinder.yourdictionary.com/blog/where-to-play-wordsapes-online-no-download/> (last accessed April 26, 2021).

far cry from the streamlined, frictionless option of playing a game in a native app on one's phone.

- In some cases, Prof. Hitt provides no valid source at all to support his claims that a particular game app is available on the PC.⁷
- Prof. Hitt includes in his analysis apps that are available on a PC only as web apps, as opposed to native apps. The record, however, is replete with evidence that web-apps are inherently bad substitutes to native apps.

39. After correcting for the inaccuracies described above, the overlap between iOS and PC game apps shown in Prof. Hitt's Figure 3 decreases substantially. Of the top 25 iOS game apps Prof. Hitt identifies (by number of downloads in Fiscal Year 2019) only 48% (12 out of 25) are available to play on PC, either through the developer's website, or through a popular storefront like the Microsoft Store or Steam. This includes games that are only available to play through web apps. This is far lower than the 88% of iOS apps that Prof. Hitt originally identified as available on both platforms. When considering the platforms on which popular games are available, Figure 10 below lists only games that are natively available on PC, showing the numbers are even lower.

40. *Third*, Prof. Hitt claims that "[d]evelopers, including Epic, treat the [Apple] App Store and other game transaction platforms as substitutes for making game transactions" (Hitt, Section III.C). To substantiate this claim, Prof. Hitt provides documentary evidence "show[ing] that developers consider the relative benefits of different game transaction platforms along multiple dimensions in deciding on what platforms to transact." He also points to documents that Epic purportedly "considered" the App Store and other transaction platforms before deciding to focus on launching on iOS before Android, rather than both simultaneously. Again, Prof. Hitt misinterprets this evidence. Choosing one platform *before* another does not show the two are substitutes. Ultimately, and in short order, Epic launched Fortnite on *both iOS and Android*. If they really were substitutes, Epic would have chosen one *in lieu of the other*, to avoid the platform-specific costs.

41. *Fourth*, Prof. Hitt claims that "[g]ame developers who have decided to make games for iOS devices have multiple options for making paid transactions with iOS users outside of the App Store, even for content consumed on iOS apps" (Hitt, Section III.D). To substantiate this claim, Prof. Hitt points to two features that he claims allow users to circumvent the Apple App Store: first, developers who allow users to "link" accounts across devices (like Epic allows with Fortnite), and second, virtual currencies, such as Fortnite's V-Bucks, which allow users to buy content that is accessible across platforms. As a threshold matter, it is important to note that

⁷ For example, Prof. Hitt provides one source indicating the platforms on which the game app "Guns of Glory: Conquer Empires" is available in his backup materials. The source he provides is a hyperlink allowing the user to download a game with *a different title* ("Guns of Glory: The Iron Mask") in the Google Play Store. The source makes no mention of PC support for the game app. See the file "ex_19-22 42-43.xlsx" in Prof. Hitt's backup materials.

Prof. Hitt’s definition of the product market includes “initial downloads, re-downloads, and updates” (Hitt, ¶21), none of which can be facilitated by another store. Prof. Hitt’s suggestion here is therefore directed at only one type of transaction – in-app purchases – which he suggests could be substituted for purchases *outside* the app. In other words, in order to use the features Prof. Hitt points to in order to avoid the App Store, a game player using her iOS device would have to first stop playing on her iOS device, log onto her console or PC to make a purchase, then leave that device and return to her iOS device. It is unclear how a user would accomplish this series of steps while away from home. It is also unclear how Prof. Hitt intends to impose this additional friction on users without losing substantial transaction volume; Prof. Hitt does nothing to address the commercial viability of this proposal. Moreover, Prof. Hitt does not even show that users play games near-simultaneously on multiple devices. On the contrary, the empirical evidence shows Fortnite users do not operate in this manner. Overwhelmingly, users in a given month only use one platform (see Figure 14 below). Prof. Hitt’s claim here is little more than speculation that is disproved by actual data. Moreover, this hypothetical behavior is made even more unlikely by the anti-steering provisions in Apple Developer Guidelines, which restrict developers from directing their users to other platforms on which digital goods may be purchased.

2. *Users Do Not View Different Platforms as Competitively Sufficient Substitutes*

42. Similar to the flawed analysis for developers, a large portion of the analysis by Prof. Hitt (on which Prof. Lafontaine relies), and the entirety of the survey conducted by Prof. Hanssens, do not address user substitution (Hitt, Sections III.E, III.F, III.G, and III.H). Rather, these experts focus mainly on device ownership, and, in the case of Prof. Hanssens’s survey, the even broader question of device *access*. While ownership or access to products are necessary for substitution, even Apple’s Experts concede that users would not go out and buy additional devices due to an increase in the price of apps, they are not a *sufficient* condition to show products are substitutable. Users can and do own or have access to distinct products with different use characteristics. Therefore, the data presented does nothing to distinguish substitutes from non-substitute goods (i.e., those used in addition to, or even as complements to, each other). Apple’s Experts did not endeavor to test for substitutability directly, an issue that I remedy. I address below each of Prof. Hitt’s three analyses presented in sections III.E through III.H.

i. *Having access to a device does not demonstrate a willingness to substitute between devices or to multi-home*

43. Prof. Hitt claims that consumers multi-home because they “use, own, or have access to multiple devices on which game developers offer games” (Hitt, ¶55). This is based on Prof. Hanssens’s survey, the headline result which is that 92% of surveyed iOS users have stated that they “regularly used” *some* other electronic devices, for *some* purpose, in the last 12 months (Hitt, Figure 9). This reasoning is deficient for several reasons.

44. *First*, this says nothing about users’ ability or interest in substituting one

platform for another, either generally, or specifically in the context of game playing or game transactions. In fact, the regular concurrent use of multiple electronic devices – which typically come at considerable cost to the user – is strong evidence that these goods are used incrementally, for distinct purposes, rather than as substitutes. As a matter of basic economics, consumers gravitate more strongly towards using only one good if the goods are closer substitutes. For example, if a consumer viewed Coke as a close substitute to Pepsi, but preferred Coke, they would be unlikely to purchase much (if any) Pepsi given the choice between the two. In the extreme case of “perfect substitutes,” two goods can be used in the exact same way, thus, the consumer would only ever own and use one good (especially when it has a high per-unit cost like a gaming console). The fact that iOS users are “regularly using” other devices is the hallmark of non-substitutable goods. Mobile and non-mobile devices are not good substitutes because they are differentiated across many dimensions, such as computing and graphical power, portability, and wireless capability. Moreover, Prof. Hanssens’s survey does not consider important factors that would offer even indirect evidence of substitutability (or not) between devices, for example, whether user devices are personal or work devices. A user who owned two devices – one for work and one for personal use – would be more likely *not* to be using those devices as substitutes, because they serve distinct purposes.

45. The “evidence of multi-homing” described by Apple Experts in this case indicates instead that customers use different platforms serially, rather than in parallel, to address different needs. Thus, the products are not substitutes. If consoles and mobile phones were reasonable substitutes with respect to games, as Apple’s Experts posit, consumers would have no reason to spend hundreds or thousands of dollar to buy these specialty devices and the attendant games, because virtually every user of game consoles already has a mobile phone. Users take advantage of the products on different platforms to accommodate different, non-substitute use cases.

46. *Second*, having access to, or regularly using an electronic device in general, does not indicate a consumer’s ability or willingness to multi-home in order to access digital games, despite Prof. Hitt repeatedly conflating these concepts (Hitt, Section III.F). Apple App Store users and iOS Fortnite players could use laptops for many purposes that are unrelated to playing games, such as word processing, emailing, or web browsing. Thus, the mere finding by Prof. Hanssens that 71% of iOS App store users and 80% of iOS Fortnite players “regularly used” a laptop in the last 12 months (Hanssens, Exhibit 8) is not indicative that survey respondents used these devices *for the same or similar purposes* as the iOS device – so-called “multi-homing,” nor is it an indication that these laptops are even capable of running Fortnite. These data provide no indication of multi-homing. In contrast, Fortnite data shows that the vast majority of Fortnite users in general, and iOS users in particular, do not multi-home, in the sense that they do not use multiple platforms for the same purpose, i.e., to play Fortnite. I illustrate this point in Figures 14 and 15 below.

47. For example, one could regularly use multiple devices for work, such as a company-issued PC or a mobile phone, without having the ability to install, update, or play games on them. Similarly, one could sometimes use a friend’s device, such as a game console,

without having the ability to use it in the same manner as one's own personal device. Nor would they have the ability to increase their use of the friend's console in the face of a SSNIP on game distribution on their personal iPhone. Yet Prof. Hanssens explicitly directed survey respondents to include friends' devices when considering the devices to which survey respondents had access – without regard to their ability to use these devices as *substitutes* to their personal devices in the face of a SSNIP:

“Next, we are interested in understanding what other types of smartphones, if any, were available for you to regularly use in the last 12 months but that you did not regularly use. **An example would be the smartphone of a member of your household or of a friend that you could have regularly used but that you did not regularly use in the last 12 months.**” (*emphasis added, Hanssens First Report, Appendix G-1, question A20.*)

48. Prof. Hitt relies upon the response to this question when he considers the set of devices that impose a competitive restraint on iOS game app distribution. This is clearly wrong. Most obviously, a friend's device is of no use in facilitating game app downloads and game updates, both of which Prof. Hitt acknowledges to be transactions at issue in his market definition (Hitt, ¶21). A friend's device is also of no use for in-app transactions; it is simply untenable to suggest that many (or any) consumers facing a 5-10% increase in the price of app distribution on their personal iPhone would turn to making their future in-app gaming transactions, across multiple games, on the console of a friend. Apple's Experts conducted no survey and provided no evidence suggesting this is a reasonable, or possible, scenario.

49. *Third*, apparently recognizing that no consumer would go out and *buy* a console due to a SSNIP on iOS game apps, Profs. Hitt and Lafontaine should have recognized that a consumer that *did* go out and buy a console is likely using multiple devices incrementally (rather than as substitutes) for game playing. The data that Prof. Hitt presents, absent further analysis, is consistent with both use as substitutes and incremental or even complementary use (Hitt, Figures 9, 13, 20). My regression analysis, discussed above, directly tests whether consumers' use of multiple devices to play Fortnite reflects actual substitution, and finds that it does not.

ii. Most iOS Fortnite users do not multi-home

50. Prof. Hitt “assessed the degree to which consumers play games across multiple devices” (Hitt, ¶55). Here again, Prof. Hitt relies on a finding by Prof. Hanssens that 92% of survey respondents who are iOS Fortnite users also play *some* games on non-iOS devices. Prof. Hitt also points to Epic's data that 36% of iOS Fortnite users also play Fortnite on non-iOS devices. But that datum means that the vast majority of users – 64% – played Fortnite *only* on iOS. And the remaining 36%, who have *at some point* played on multiple platforms, do so very sporadically. Figure 1 above, for example, showed that 81% of iOS Fortnite players who also use another device do not play on iOS in any given week. In other words, these are essentially

single-homers who extend their play to iOS only rarely. The fact that someone might *one time* play on another platform (which is what Prof. Hitt measures) is not evidence of competitively meaningful substitution.

iii. *Fortnite is not representative of other iOS apps*

51. Prof. Hitt assessed “the degree to which consumers could multi-home within the most popular games” (Hitt, ¶55), by studying Fortnite. As a threshold matter, that consumers “could” do something is not the relevant standard for market definition – rather, it is what they are *likely* to do and if a change in their behavior, such as substituting away from a product, is *likely* to restrict prices. Moreover, Prof. Hitt’s evidence is nothing more than confirmatory that some Fortnite users access Fortnite from multiple devices and make transactions on multiple devices. Even then, however, Prof. Hitt’s presentation of the evidence is misleading. Prof. Hitt studies Fortnite users who access Fortnite on iOS and where they make purchases. He finds that 75.9% make no purchases, 15.8% purchase *only* on non-iOS platforms, 5.6% purchase *only* on iOS, and 2.8% purchase on both iOS and non-iOS platforms (Hitt, Figure 15). Prof. Hitt claims this indicates that game transaction platforms are substitutes to the App Store for paid game transactions. However, this confuses what *can* happen with what is *likely* to happen. Compared to the 24.2% of iOS users who make a purchase, only 2.8% do so on multiple platforms. All of the other iOS users making any purchase *only* use iOS or *only use* another platform. Prof. Hitt has not drawn the obvious conclusion that there is thus very little multi-homing in transactions (2.8% out of 24.2%), but instead concluded there *could* be more multi-homing.

52. Significantly, Prof. Hitt relies extensively on Fortnite data to support his cross-platform market definition (Hitt, Section III.E, II.G, III.H). This overlooks the fact that Fortnite is a uniquely cross-platform game (as I elaborate on in Section IV.D), and as such is not representative of typical game development, game playing, or game transactions as a whole. Thus, the high level of single homing reflected even in the data from a uniquely multi-platform game such as Fortnite certainly refutes any notion that there is a relevant cross-platform game app distribution market. And even if Prof. Hitt could use the Fortnite data to show substitution between platforms (which he does not), that would *still* not prove a cross-platform game app distribution or game transaction market, because that data cannot substantiate substitutability for the hundreds of thousands of game apps that are not available across as many, or even any, non-mobile platforms.

C. Apple’s Experts’ Analyses That Purport To Demonstrate Substitution Across Platforms are Flawed

53. Although Prof. Hitt focuses the bulk of his analysis on ownership and access to multiple devices that, as shown above, cannot show substitution (let alone enough to prove his game transaction market), he offers a few studies he claims show actual substitution. None does. Below, I address four analyses put forth by Prof. Hitt: of users who download on iOS a console “game transaction app”; of the launch of Fortnite on Switch; and of each of Spotify’s and

Netflix's decision to stop offering subscriptions for in-app purchase on iOS. Prof. Evans addresses Prof. Hitt's fifth example, related to Fortnite's removal from the App Store.

1. Console/iOS Switching Analysis

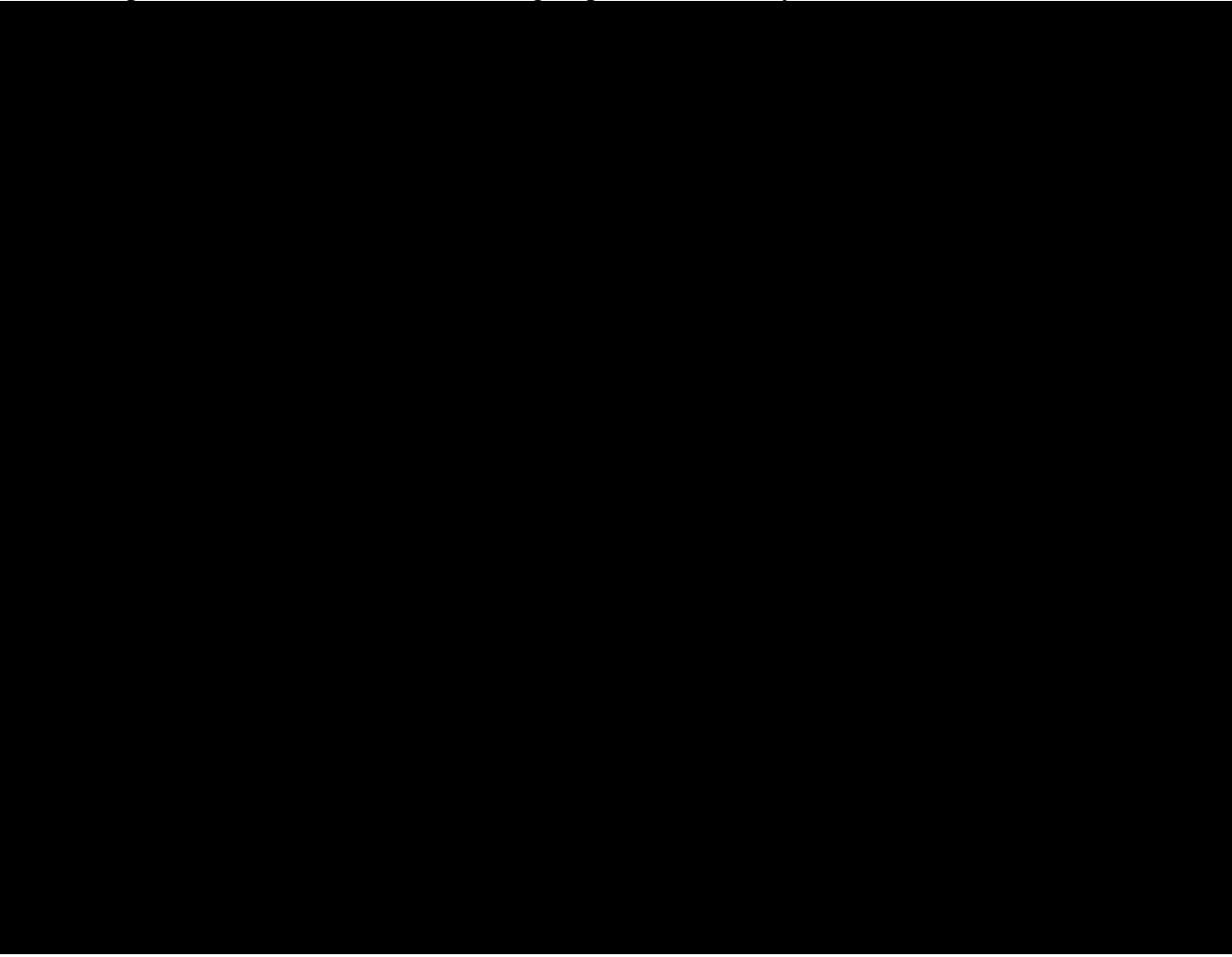
54. Prof. Hitt purports to show iOS users substituting spending on iOS gaming apps for spending on game console apps by studying users who downloaded a "companion app" during 2018 (Hitt, Figure 16, ¶¶82-85). Prof. Hitt posits that the download of such a "companion app" is an accurate proxy for identifying individuals "who have likely started playing games more frequently on a console or PC" in 2018, either because they just purchased a new console or gaming PC or because they decided to start using them (Hitt, ¶83). His analysis compares the growth rate of the amount users spend on iOS game apps following the download of a companion app (the "treatment" group) to the growth rate of money spent on game apps by iOS users who have not downloaded a companion app (the "control" group). Prof. Hitt claims that this analysis shows substitution because "iOS device users who downloaded a companion app in 2018 had less spending growth on iOS games between 2017 and 2019" (Hitt, ¶84). This is wrong for at least two reasons.

55. *First*, Prof. Hitt made no attempt to validate whether downloading a companion app is associated with the purchase of a new console, with a decision to play more on an existing console, or with an uptick in the user's spending on non-mobile gaming apps. Notably, some of the apps that Prof. Hitt identifies as "companion apps" appear completely unrelated to user playing time or spend on console or PC games. For example, one app that Prof. Hitt considers is the "Nintendo Switch Parental Controls," which a user is more likely to download if *someone else in their household* (like a child) has begun playing on a console, or has been playing too much on a console, such that play needs to be curtailed. Other companion apps suggest users *have* a console, but there is nothing about them suggesting a *recent* acquisition or a *recent* change in gaming preferences. Absent any information about the validity, or even the meaning, of the proposed proxy, Prof. Hitt's results are meaningless.

56. *Second*, to the extent Prof. Hitt's proxy can be relied on to reach any sort of meaningful conclusion, the analysis shows that there is incremental, distinct usage between consoles and iOS gaming, rather than substitution. Rather than presenting the *growth rate* of iOS game app expenditures – a measure that has no bearing on substitution and that obfuscates the actual spending by each user group he analyzes⁸ – Prof. Hitt should have presented the change in *actual dollar* spend on iOS game apps by members of the "treatment" and "control" groups.

⁸ If the spending of the "control" group increased from \$10 to \$12, while the "treatment" group spending increased from \$100 to \$115, Prof. Hitt's focus on growth rate would suggest a more meaningful growth in the control group (20% compared to 15%), notwithstanding the much more modest growth in actual spend by that group (\$2 compared to \$15).

Figure 4 is a replication of Prof. Hitt's Figure 16, corrected to show the change in actual dollar spend from 2017 to 2019 for each group Prof. Hitt analyzes.



2. Switch Analysis

58. Prof. Hitt next analyzes users who played Fortnite on both Switch and iOS in June 2018, and from this analysis, claims that following the launch of Fortnite on the Switch during that month, there was a relative *decrease* in the time spent playing on iOS and in spending on iOS (Hitt, Figure 17, ¶¶86-90). Like his console analysis, Prof. Hitt purports to compare a control group (users who accessed Fortnite on iOS, but *not* on Switch) with a treatment group (those who accessed Fortnite on iOS *and* Switch). He claims this evidence “shows that existing iOS Fortnite users substituted transactions between iOS and the Nintendo Switch after Fortnite became available on the Nintendo Switch” (Hitt, ¶90). There are two major flaws in this analysis, which render his conclusion unreliable, and misleading:

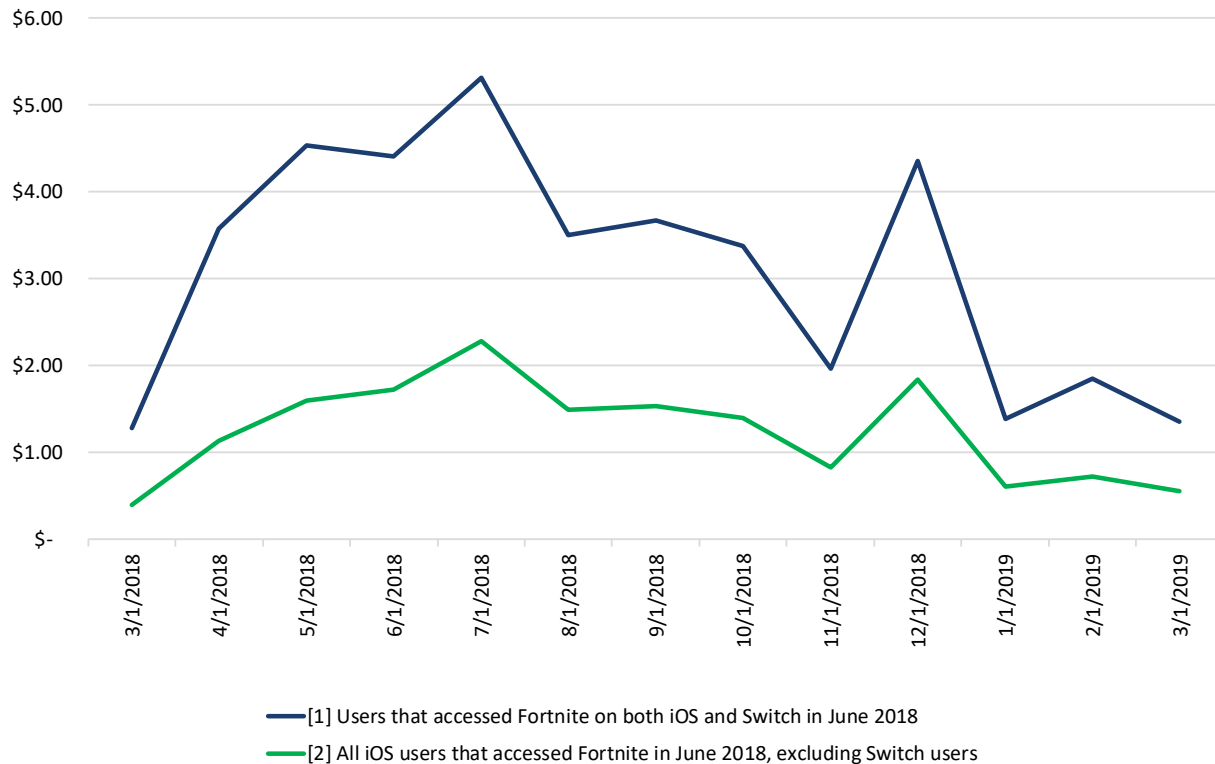
59. *First*, Prof. Hitt's analysis does not actually show the spending by his treatment

group on the Nintendo Switch following the launch of Fortnite. He only studies relative spending on iOS. Even if his were analysis was correct that Fortnite players reduced spending on iOS (it is not, as I show next), he has not shown that the spending *moved to* Switch (as opposed to a reduction in total spending or spending moving to another platform). Thus, his claim that his analysis shows substitution between iOS and Switch is thus baseless.

60. *Second*, Prof. Hitt has presented a misleading index of spending by the treatment and control group over time (i.e., the change in the sum of every individual user's spending in each group) (Hitt, Figure 18):

- Prof. Hitt aggregates spending from all 456,675 users in his treatment group and all 13,198,010 users in his control group and constructs an index where March 2018 is set to a baseline of “100”, with all subsequent months' values showing spending relative to the total spending in March 2018 (\$587,872 for the treatment group and \$5,188,220 for the control group).
- Prof. Hitt's indexing methodology obscures the fact that the two groups are markedly different in their spending habits. At the start of the analysis in March 2018, each user in the treatment group spent on average \$1.29 on iOS, while each user in the control group spent on average less than one third of that amount – only \$0.39. Given the disparate starting points, a \$1 increase for both would constitute a considerable 78% increase for the treatment group, but a much larger 256% increase for the control group. Plotting actual changes rather than indexed changes fixes this confusion.
- Using the very same data used by Prof. Hitt, I plot the per-user figures in dollars in Figure 5 below. This reverses Prof. Hitt's conclusion. Per-user spending in *dollar terms* starts higher for the treatment group and increases more following the June 2018 launch of Fortnite on the Switch – an increase of \$4.03 per user in the treatment group by July 2018, compared with an increase of \$1.89 per user in the control group. That is, Prof. Hitt's claim that “Fortnite users who accessed the game on both iOS and the Nintendo Switch in June 2018 [...] spent less in the App Store in June 2018 and subsequent months (particularly in the months immediately after June 2018) compared to other iOS users” is flat out wrong (Hitt, ¶90).

**FIGURE 5: WORLDWIDE FORTNITE IOS REVENUE PER USER,
BY USER ACCOUNTS THAT ACCEDED
FORTNITE ON AN IOS DEVICE IN JUNE 2018**



Sources: EPIC_04315058, EPIC_04315058_1, EPIC_04315058_3.

Notes: See DX-4823.

61. Additionally, Prof. Hitt offers an analysis of the *share* of time that iOS Fortnite players who also played Fortnite on the Switch spent playing on each platform before and after Fortnite was first launched on Switch (Hitt, Figure 17, ¶90). Prof. Hitt shows that the *share* of Fortnite game revenue and playtime on a given platform decreased for all platforms when Fortnite was launched on the Switch. He argues that the Switch is therefore a substitute for iOS and other platforms, and that the digital distribution of games on Switch is in the same relevant market as game app distribution on iOS and other platforms.

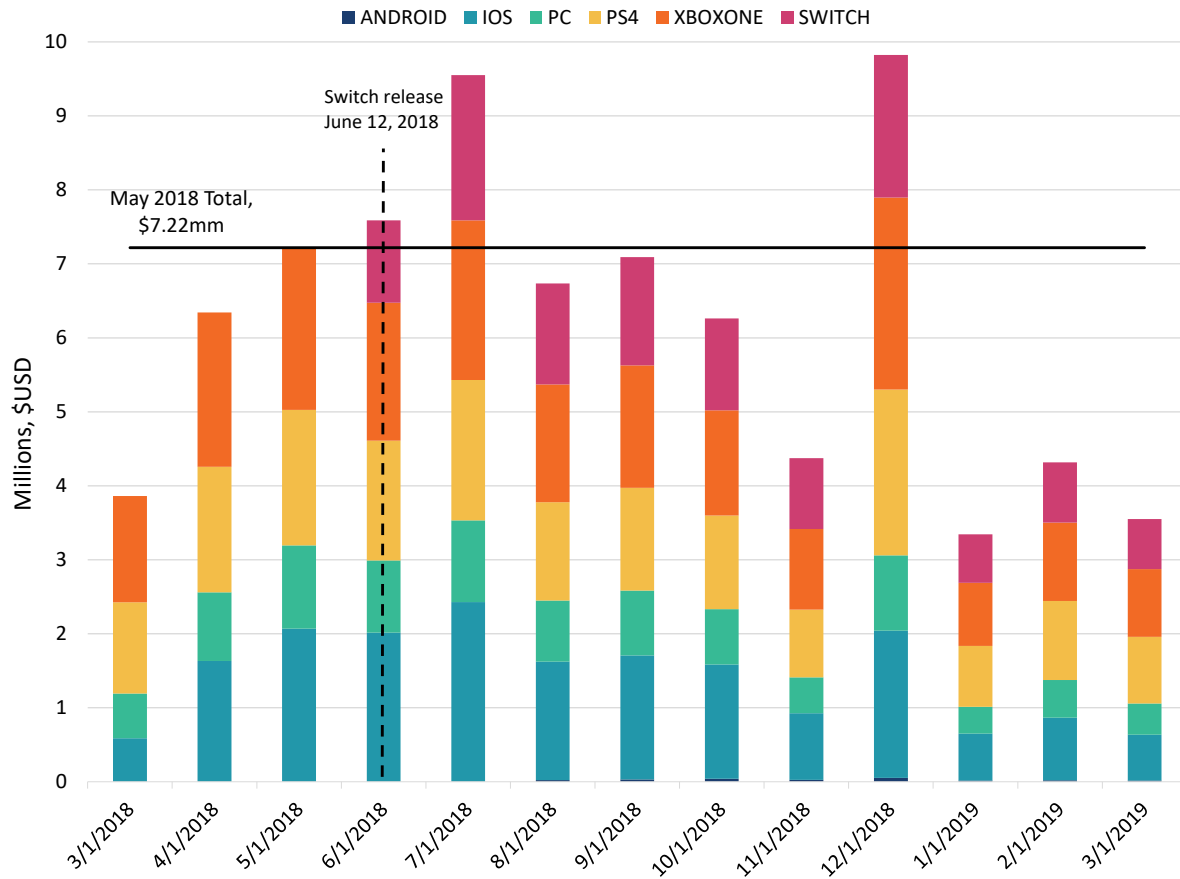
62. This test is of no import because, as a mathematical matter, the introduction of the Switch necessarily led the *share* of revenue on non-Switch devices to decrease, even if actual spending *on those devices* remained unchanged or even increased. Both before and after Fortnite was introduced on the Switch, shares across all platforms (as defined by Prof. Hitt) must sum to 100%. After Fortnite was introduced on Switch, there was another platform, so *if any user spends any money on the Switch* (even a de minimis amount), there will be some share of revenue now attributable to the Switch, and therefore, all the other platform shares will add up to less than 100%. The relevant question, which is not addressed by Prof. Hitt's analysis of shares,

is whether users shifted all or a significant portion of their spending from iOS to the Switch (consistent with substitution), or whether they shifted none (or little) spending to the Switch and instead spent more on Fortnite in total (*inconsistent* with substitution). The same holds true for share of time spent playing on a platform.

63. Consider a simple example of a user who spent \$100 on Fortnite while playing on her iPhone prior to the introduction of Fortnite on the Switch. The “share” of revenue on the iPhone is 100% in Prof. Hitt’s analysis. She then buys a Switch. Perhaps she *substitutes* \$50 of spending to the Switch, *i.e.*, she spends \$50 on each platform. She could also *increase* her iOS spending by spending an extra \$100 on the Switch, *i.e.*, she spends \$200 in total. Prof. Hitt’s flawed analysis would show a 50% revenue *share* in both circumstances, and his analysis therefore cannot distinguish substitutability from a product used in an incremental (or even complementary) fashion.

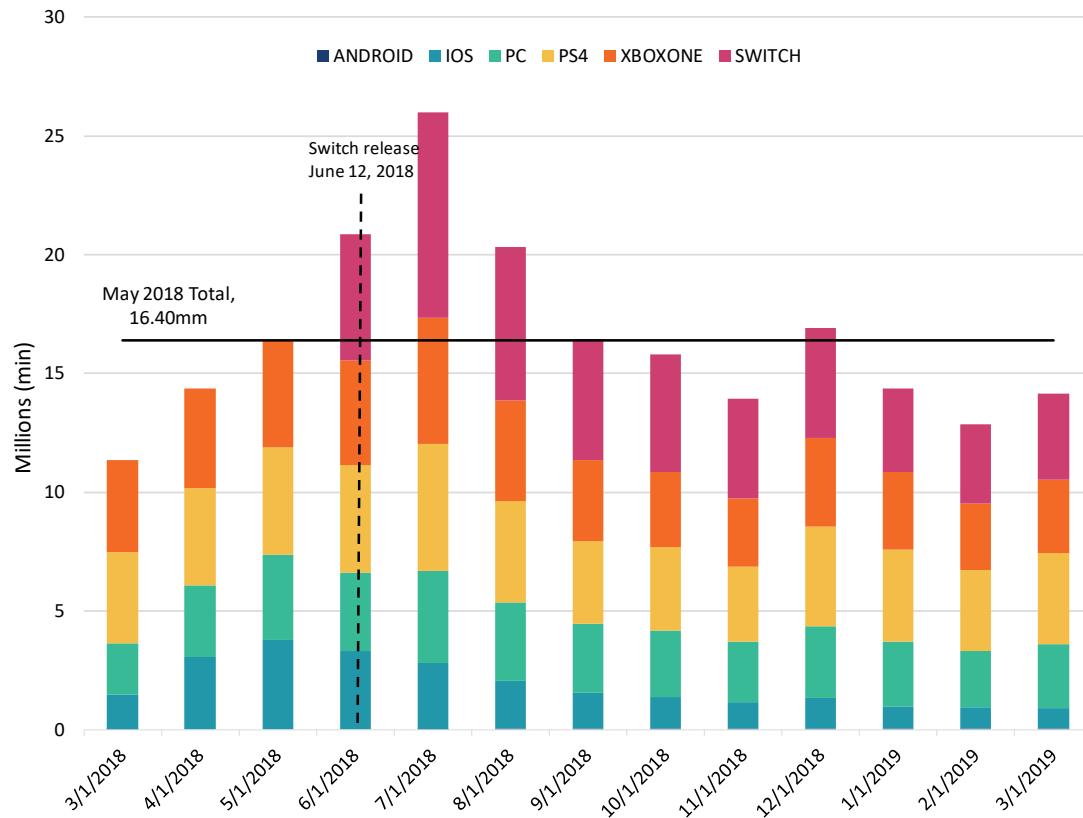
64. A correct analysis looks at the change in actual spending and game play, by platform, after a user starts playing on a Switch to separately identify substitutability and incremental use of another platform. Figure 6 is a replication of Prof. Hitt’s Figure 19, corrected to show revenue by month for Fortnite users who played on both iOS and the Switch in June 2018, the same population analyzed by Prof. Hitt. Figure 6 shows that iOS revenues are essentially flat between the months just before and just after the Switch’s Fortnite release – that is, iOS players *do not* substitute meaningful spending away from iOS and towards Switch. Rather, as the bar graphs show, the introduction of Fortnite on the Switch largely just increases total spending (*i.e.*, the pink bars on the top are additive to the other bars, which are relatively constant over the months after the release of Fortnite on the Switch). In fact, iOS revenue in the month after the introduction of Fortnite to the Switch actually *increases*, contradicting Prof. Hitt’s conclusion. Figure 7 provides the same analysis for gameplay, with essentially the same results. The Switch data thus refute, rather than prove, substitution, consistent with my regression analysis discussed above.

FIGURE 6: FORTNITE REVENUE BY PLATFORM FROM USERS THAT PLAYED ON BOTH IOS AND NINTENDO SWITCH IN JUNE 2018



Source: PX-1023.

FIGURE 7: MINUTES OF FORTNITE PLAYED BY PLATFORM AMONG USERS THAT PLAYED ON BOTH IOS AND NINTENDO SWITCH IN JUNE 2018



Source: PX-1022.

3. Spotify Analysis

65. Next, Prof. Hitt presents a case study on the purported effects of the music streaming service Spotify ceasing to allow paid subscriptions to be initiated through the Spotify iOS app (Hitt, Figures 22-25, ¶¶102-104). Spotify implemented this policy change in May 2016 to avoid paying Apple's 30% commission, which placed Spotify at a competitive disadvantage vis-à-vis Apple's competing music offerings because, like Apple, it had to pay artists for their music, but unlike Apple, it had to also pay Apple's 30% commission as well. Prof. Hitt claims this study shows that neither Spotify's revenue nor its user growth were affected by the policy change, and therefore transactions on non-iOS devices are good substitutes to in-app purchases on iOS. These conclusions are not supported by the data.

66. As an initial matter, Prof. Hitt – having claimed a games-transactions-only market and having argued (along with Prof. Lafontaine) that the *distribution* of game apps is inherently different from the *distribution* of non-game apps – goes outside of his own proposed market to try to show substitution within that market. This is nonsensical. If game apps and

their distribution are as different from non-game apps and their distribution as Apple's Experts claim, then a Spotify case study purporting to show substitution for a *non-game* app transaction cannot inform substitution across platforms for *game* app transactions.

67. Setting this aside, Spotify's case is unique for three reasons:

- a. *First*, Spotify monetizes through a low-friction auto-renewing subscription that a user has to set-up only once, when first signing-up for the service. This is in contrast to many other apps, including most game apps, that are monetized through non-subscription in-app purchases. Most in-app transactions – and especially game transactions (the market Apple's Experts propose) – typically rely on small, frequent, recurring “microtransactions” for the purchase of “skins,” a new level, a new photo editing tool, a package of document or file conversions, etc. In those cases, the platform on which the app is used (and, relevant to Prof. Hitt's market definition, the platform on which the game is played) is inextricably linked to the platform on which the user is transacting. Even if users may find it palatable to leave the platform *once* to enter a long-term contract, as in the case of Spotify, that is a very different proposition from leaving the platform daily to transact outside the app, rather than in-app.
- b. *Second*, unlike most of the apps on the App Store, Spotify had the option, under Apple's “reader” rule, of altogether ceasing to offer users the option to purchase subscriptions through Spotify's iOS app, thus “forcing” its users to seek transactions elsewhere (or forego a Spotify subscription – a consequence I discuss below). Most other apps do not have that option. Rather, most apps *are required to* offer for in-app purchase on iOS any and all content they make available for purchase on any other platforms. This includes all gaming apps.
- c. *Third*, under Apple's rules, developers are subject to a “gag order” whereby they are not allowed to even *inform* users, within the app or using user information collected through the app, of the possibility of buying in-app content on another platform. Thus, the typical user only sees the content within the app, and has no way of knowing, in the moment, that the same content may be available to her on another platform, or how to purchase that content elsewhere.

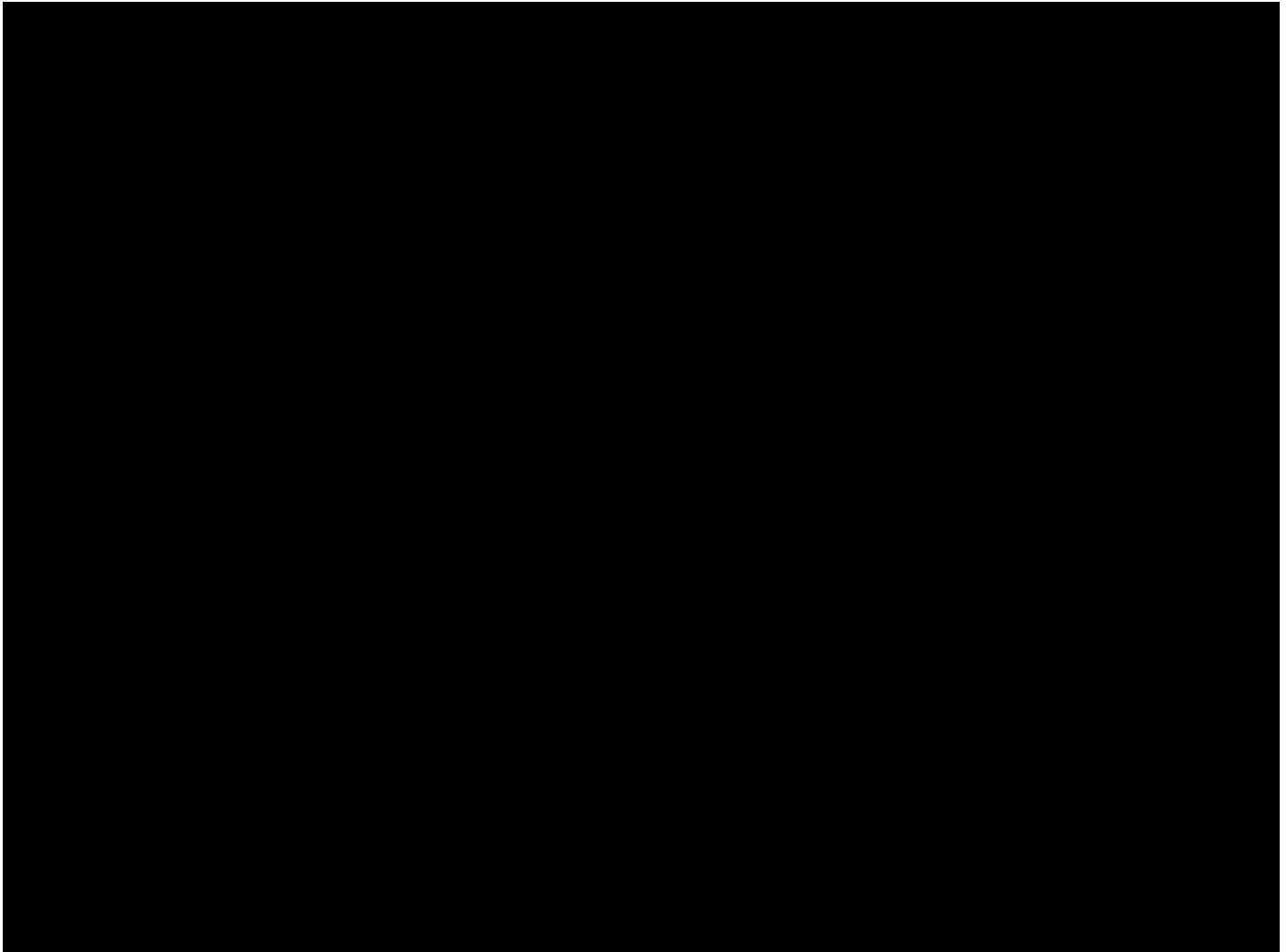
68. Consistent with these facts, I am not aware of *any* example of an app offering recurring (non-subscription) in-app purchases affirmatively trying to divert users to purchase content available for in-app purchases outside the app, on another platform. This is meaningful because just like Spotify, other app developers have a huge incentive – much larger than a SSNIP – to divert users to platforms where such purchases are not subject to Apple's 30% commission. The fact that app developers do not try – let alone succeed – demonstrates their inability to substitute one distribution channel for another.

69. Finally, Prof. Hitt's analysis of the Spotify data is unreliable. Prof. Hitt claims that growth in total Spotify monthly active users “was not coupled with a decrease in the share of

total Spotify active users or downloads on iOS” (Hitt, ¶103). This is incorrect. Prof. Hitt’s analysis only shows that total Spotify downloads on iOS are roughly constant before and after the policy change, despite the fact that the number of iOS users and Spotify users were increasing rapidly around this period. Because Spotify downloads on iOS remained largely flat, while, for example, downloads of Spotify on Android continued to increase, iOS’s share of mobile device Spotify downloads *actually fell* after May 2016.

70.





4. Netflix

72. Prof. Hitt also points to Netflix's decision to stop offering subscriptions on iOS. Prof. Hitt presents no analysis *at all* on the impact of Netflix's decision, other than to state that Netflix's *total* revenue increased from \$15.8 billion to \$20.2 billion and concluding that

¹⁰ SPOT-EPIC-00000932, SPOT-EPIC-00001023.

“[c]onsumers therefore substituted transactions through the App Store for transactions on other transaction platforms as well as through the Netflix website” (Hitt, ¶105). But Prof. Hitt fails to show how much of that revenue came from iOS before or after Netflix’s change in practice; whether there was any change in Netflix’s growth trend; and whether usage of Netflix on iOS was affected (and if so, how). In short, he does not show any evidence of substitution. In addition, all of the other shortcomings of Prof. Hitt’s Spotify analysis discussed above (e.g., that Netflix is a “sign up once” subscription subject to Apple’s “reader” rule) are present here, too.

D. Different Game Platforms are Technologically Distinct, Which Means Their Distribution Channels Are Not Functional Substitutes

1. Smartphones and PC/Consoles Have Starkly Different Hardware

73. Apple’s Experts claim a market that exists across starkly different devices: mobile iOS and Android devices; Windows- and MacOS-based computers; and PlayStation, Xbox, and Switch consoles. In lumping these devices together, Apple’s Experts fail to account for the considerable differences between the physical, technological, and functional attributes of these platforms. This is another example where Prof. Lafontaine’s emphasis on “intuitive” groupings fails; there is nothing intuitive about suggesting that a PlayStation 4 and an iPhone are close substitutes, for gaming or anything else.

74. First, a small mobile device touchscreen simultaneously serves as an integrated visual output and a controller for mobile device games, requiring users to control mobile games through thumb taps or swipes on the screen. In contrast, PC and console systems require multiple pieces of hardware. In addition to a much larger video output device like a TV or a computer monitor and a PC or console unit itself, these typically include one or more handheld controllers with multiple buttons and joysticks for console systems; and a traditional QWERTY-style keyboard and a computer mouse for PC systems. (The Switch is the only exception in this regard: while it operates as a console, it also has a handheld mode that allows a user to use dedicated controls and a 6.2-inch diagonal touchscreen. As discussed below, the attributes of the Switch, even in handheld mode, are very different from an iPhone’s attributes.)

75. Second, intensive processing required for high definition graphics on gaming consoles and PC uses significantly more power, generates more heat, and requires more cooling in order for the computer processors to continue to function and perform properly. Cooling systems for consoles and gaming PCs are large, and sometimes even liquid-based. Mobile devices have the strict size and weight limitations in order to fit in the palm of a hand, and cannot utilize similar cooling systems to remove excess heat. They lack fans and, in the case of the iPhone (which is marketed as dust and waterproof), even air vents.

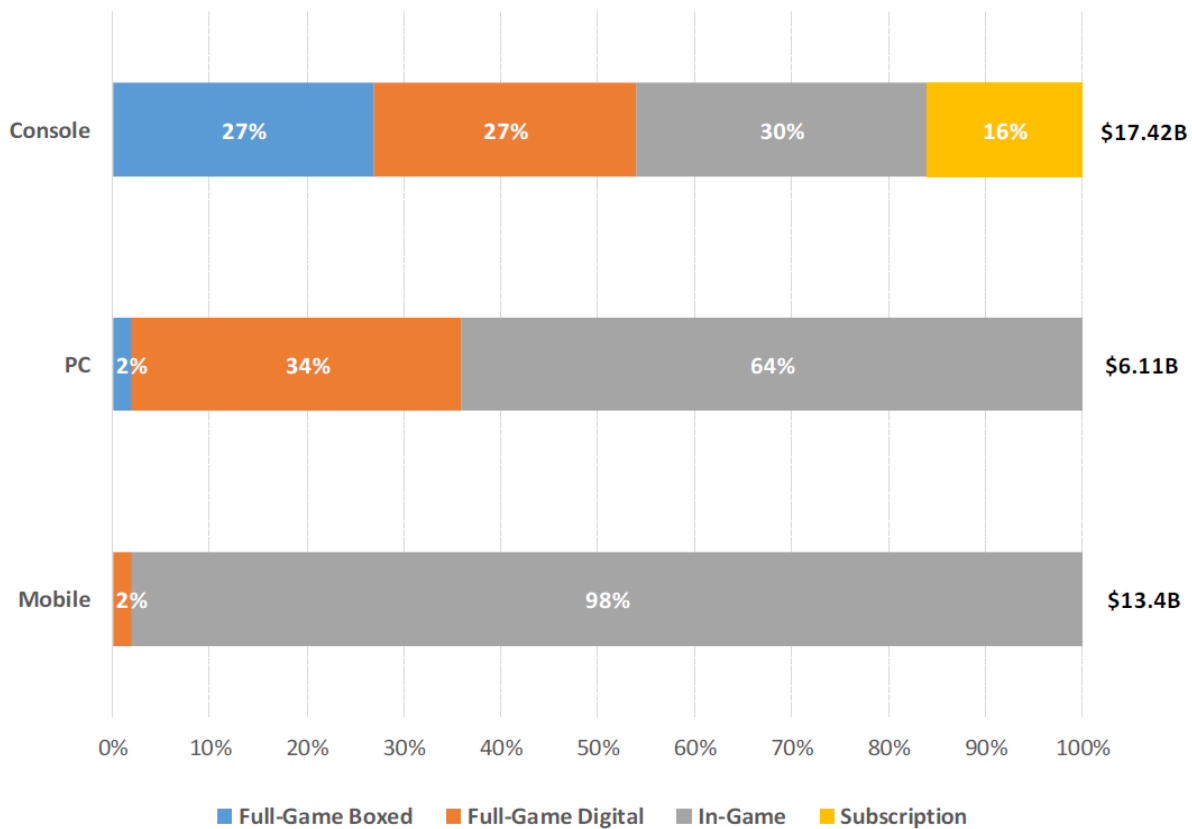
76. Third, while mobile devices are typically seen as inferior to PCs and consoles for game playing with respect to user inputs, audiovisual output, processing power and

responsiveness, they offer unparalleled portability and connectivity while on the move – a defining feature of mobile devices. Mobile devices also offer functionality that is unique to their mobility, such as cameras and GPS. No PC or console comes close to the mobility of an iPhone; the Switch is the only console that offers *some* portability, but absent a cellular connection, it is largely limited to play within the user’s home (it also lacks a camera, a GPS, an accelerometer, and a gyroscope, all of which are used in mobile gaming).

77. Hardware differences between gaming platforms drive large differences in mobile and non-mobile game design. Mobile users cannot control a game as nimbly or precisely as do users utilizing a mouse or controller on a PC or console connected to a large screen. Together with less processing power and the need to manage battery life, mobile game graphics must remain simple to render, view, and manipulate on a small screen. Conversely, constant internet connectivity, a camera, and a GPS are integral to design of mobile games like the blockbuster Pokémon Go – a game that no PC or console can support.

2. Due to Differences in Hardware, Mobile Games and PC/Console Games are Very Different

78. The upshot of the above is that smartphone games are different in the nature of game play, users, and monetization models from games on consoles and PCs. As Figure 9 shows, in 2020, U.S. console revenues, PC revenues, and mobile game revenues came from very different sources.

FIGURE 9: 2020 US VIDEO GAME REVENUE BREAKDOWN AND TOTAL

Source: PX-1025.

79. Figure 10 shows that, whereas there is large overlap between the catalogs of popular games on PC, PlayStation 4, and Xbox – all static platforms – due to the differences between mobile and non-mobile game playing, most top mobile games are released *only* on mobile platforms. This is in contrast to Prof. Hitt’s unreliable study I discussed earlier that had similar findings for consoles, but not PC, because he included different versions of games, games not available on the standard PC stores, and games available only through emulators or web browsers.

FIGURE 10: POPULAR GAMES BY PLATFORM

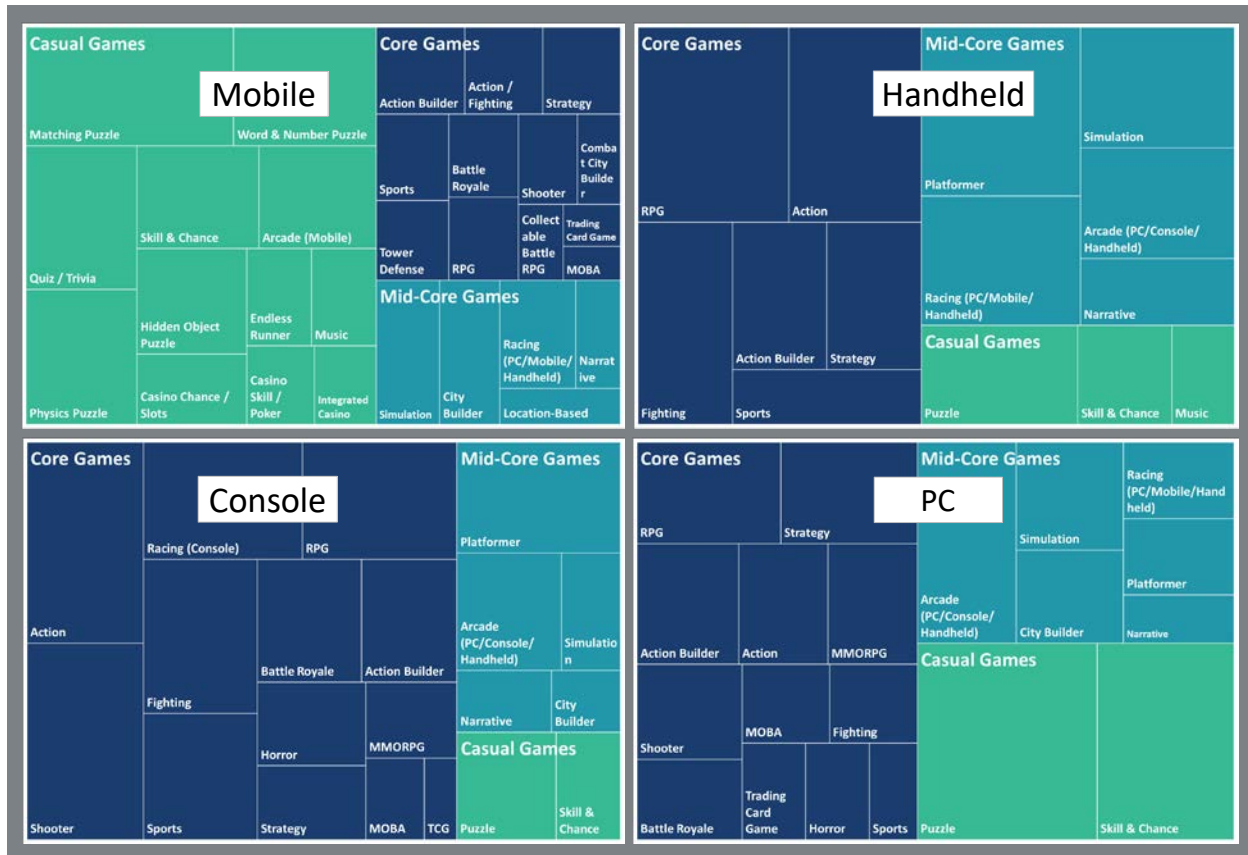
Platform [A]	Game [B]	Gross Revenue (Million USD)/ Units Sold (Million) [C]	Available Platforms [D]
Mobile	[1] Honor of Kings / Arena of Valor	9860	Android, iOS, Switch
	[2] Monster Strike	9090	Android, iOS, 3DS
	[3] Puzzle & Dragons	\$7,000†	Android, iOS
	[4] Clash of Clans	7000	Android, iOS
	[5] Pokémon GO	6460	Android, iOS
	[6] Candy Crush Saga	5730	Android, Fire OS, iOS, PC
	[7] PUBG Mobile*	\$4,300	Android, iOS
	[8] Fate/Grand Order	\$4,000†	Android, iOS
	[9] Garena Free Fire	3130	Android, iOS
	[10] Clash Royale	3000	Android, iOS
	[11] Game of War: Fire Age	\$2,800‡	Android, iOS
	[12] Lineage M*	\$2,800	Android, iOS
	[13] Roblox	2500	Android, iOS, PC, Xbox
	[14] Dragon Ball Z: Dokkan Battle	\$2,000†	Android, iOS
	[15] Candy Crush Soda Saga	\$2,000†	Android, iOS, PC
	[16] Summoners War: Sky Arena	2000	Android, iOS
	[17] Coin Master	2000	Android, iOS
	[18] Lineage 2: Revolution	1962	Android, iOS
	[19] Gardenscapes	1900	Android, iOS, PC
	[20] Marvel Contest of Champions	1581	Android, iOS
	[21] Disney Tsum Tsum	\$1,500†	Android, iOS
	[22] Fantasy Westward Journey	\$1,500‡	Android, iOS, PC
	[23] AFK Arena	\$1,450‡	Android, iOS
	[24] Homescapes	1400	Android, iOS, PC
	[25] Hay Day	1400	Android, iOS
	[26] Knives Out	1362	Android, iOS, PC, PS4, Switch
	[27] Lords Mobile	\$1,321‡	Android, iOS, PC, Fire OS
	[28] Fortnite	1200	Android, iOS, PC, PS, Xbox, Switch
	[29] Star Wars: Galaxy of Heroes	1200	Android, iOS
	[30] Onmyoji	\$1,129‡	Android, iOS, PC
PS4	[31] Marvel's Spider-Man	20	PS
	[32] Grand Theft Auto V	19.39	PS, Xbox, PC
	[33] Uncharted: A Thief's End	16.25	PS
	[34] Call of Duty: Black Ops 3	15.09	PS, Xbox, PC
	[35] Red Dead Redemption 2	13.94	PS, Xbox, PC, Stadia
Switch	[36] Mario Kart 8 Deluxe	33.41	Switch
	[37] Animal Crossing: New Horizons	31.18	Switch
	[38] Super Smash Bros. Ultimate	22.85	Switch
	[39] The Legend of Zelda: Breath of the Wild	21.45	Switch, Wii U
	[40] Pokémon Sword/Pokémon Shield	20.35	Switch
Xbox One	[41] Grand Theft Auto V	8.72	PS, Xbox, PC
	[42] Call of Duty: Black Ops 3	7.37	PS, Xbox, PC
	[43] Call of Duty: WWII	6.23	PS, Xbox, PC
	[44] Red Dead Redemption 2	5.77	PS, Xbox, PC, Stadia
	[45] Minecraft	5.43	Android, iOS, PS, Xbox, PC, Switch, Wii U
PC	[46] The Sims 3	7.96	PS, Xbox, PC
	[47] World of Warcraft	6.35	PC
	[48] Diablo III	5.26	PS, Xbox, PC
	[49] Microsoft Flight Simulator	5.12	Xbox, PC
	[50] Starcraft II	4.86	PC

Source: PX-1030.

80. As different game players prefer to play different genres of games on different platforms, the popularity of games by genre across platforms is another metric that determines

users' ability to substitute across platforms. Figure 11 shows that “casual” games (such as puzzle games) are the most popular on iOS and mobile devices, whereas “core” games (such as first-person shooter games) and “mid-core” games (such as simulations or racing games) are the most popular on consoles and PCs.

FIGURE 11: RELATIVE POPULARITY OF VIDEO GAME GENRES AND CATEGORIES PLAYED ON DIFFERENT PLATFORMS



Source: PX-1026.

81. The differences between mobile and non-mobile games are also highlighted by the huge differences in game development costs across different platforms. While the development costs of popular mobile games are tens and hundreds of thousands of dollars, PC and console games can cost upwards of \$100 million or more to develop. Figure 12 shows that the development costs for several of the highest-cost mobile and non-mobile games to develop are considerably different.

FIGURE 12: DEVELOPMENT COSTS FOR MOBILE AND NON-MOBILE GAMES

		Game [A]	Cost (Million) [B]
Mobile	[1]	Pokémon Go	\$0.45-\$0.6
	[2]	Clash of Clans	\$0.4
	[3]	Lara Croft Go	\$0.30
	[4]	Minecraft	\$0.20
	[5]	Angry Birds	\$0.12
Non-Mobile	[6]	Star Citizen	\$300
	[7]	Red Dead Redemption 2	\$240
	[8]	Star Wars: The Old Republic	\$200
	[9]	Grand Theft Auto V	\$137
	[10]	Cyberpunk 2077	\$135

Source: PX-1032.

82. If Apple’s Experts were correct that developers could compete in a single mobile-plus-non-mobile game transaction market, it would be economically irrational for developers to publish their games on both mobile and non-mobile platforms. Instead, developers could simply develop for one mobile platform, at one-tenth of a percent of the big-budget console and PC game development cost, and attract the majority of users away from console and PC to mobile device game playing. The rapid growth of big-budget PC and console game development is thus direct economic evidence that they are not in the same market as mobile games, and that game distribution and development is different across platforms. Therefore, there must be different markets for mobile and non-mobile game distribution.

83. The variation in consumers’ willingness-to-pay for mobile vs. non-mobile games is further market-based evidence that playing games on mobile and non-mobile devices is not reasonably interchangeable: the average paid iOS game download is only \$0.49, whereas new console games typically cost upwards of \$59.99.¹¹ If consumers perceived PC and console as “reasonably interchangeable” with mobile games, they would be unwilling to pay over 100 times more for a console or PC game.

¹¹ “Average prices for apps in the Apple App Store as of March 2021,” Statista, March 2, 2021, available at <https://www.statista.com/statistics/267346/average-apple-app-store-price-app/> (last accessed March 14, 2021); Huang, Michelle Yan, and Gilbert, Ben, “Here’s the reason most new games cost \$60,” Business Insider, October 29, 2018, available at <https://www.businessinsider.com/why-video-games-always-cost-60-dollars-2018-10?r=US&IR=T> (last accessed March 12, 2021).

84. Again, one reason for the Apple's Experts' market definition error is their myopic focus on Fortnite, rather than on game and non-game apps more broadly. Fortnite is an outlier: for example, Figure 10 shows that only two of the top 15 iOS games are available on a console, and only one of the top five games on any console is available on iOS. Thus, Fortnite's cross-platform capabilities are not a representative reflection of the cross-platform capabilities for a typical iOS game app.

85. Various surveys and industry analysis also show that consumers play video games on consoles, PC, and mobile devices for different reasons and at different times. If these platforms were economically meaningful substitutes, this would not be the case.

86. For example, the Apple-sponsored game player segmentation analysis relied on by Prof. Hitt in his report was conducted by Electronic Entertainment Design and Research (EEDAR).¹² It found that 41% of US gamers only ever play on a single device, and that single-device usage was more common among casual players, the demographic that favors mobile games. It further found that for multi-platform gamers, mobile devices are, "likely to be a supplemental platform that is used regularly for quick play on breaks, on-the-go gaming, and in other circumstances where HD [high definition] alternatives are not available (e.g. when someone else needs the TV)."

3. Even for Cross-Platform Games, Users Generally Single-Home

87. Data on Fortnite play across platforms further confirms that even for cross-platform games, most users do not use different platforms as substitutes.

88. Figure 13 shows that the majority of Fortnite players have never played the game on a mobile device. This is the case even though it is likely that the vast majority of Fortnite players have a smartphone (over 90% of US adults ages between 18 and 49 own smartphones).¹³ The lack of mobile play among the player base thus indicates that a large segment of users have no desire to play on mobile, rather than an inability to do so.

¹² NPD EEDAR (2019), "Gamer Segmentation, 2018/2019 Syndicated Report", available at <https://igda.org/resources-archive/2018-2019-gamer-segmentation-report-white-paper/> (last accessed April 16, 2021).

¹³ "Mobile Fact Sheet," Pew Research Center, June 12, 2019, available at <https://www.pewresearch.org/internet/fact-sheet/mobile/> (last accessed March 9, 2021).

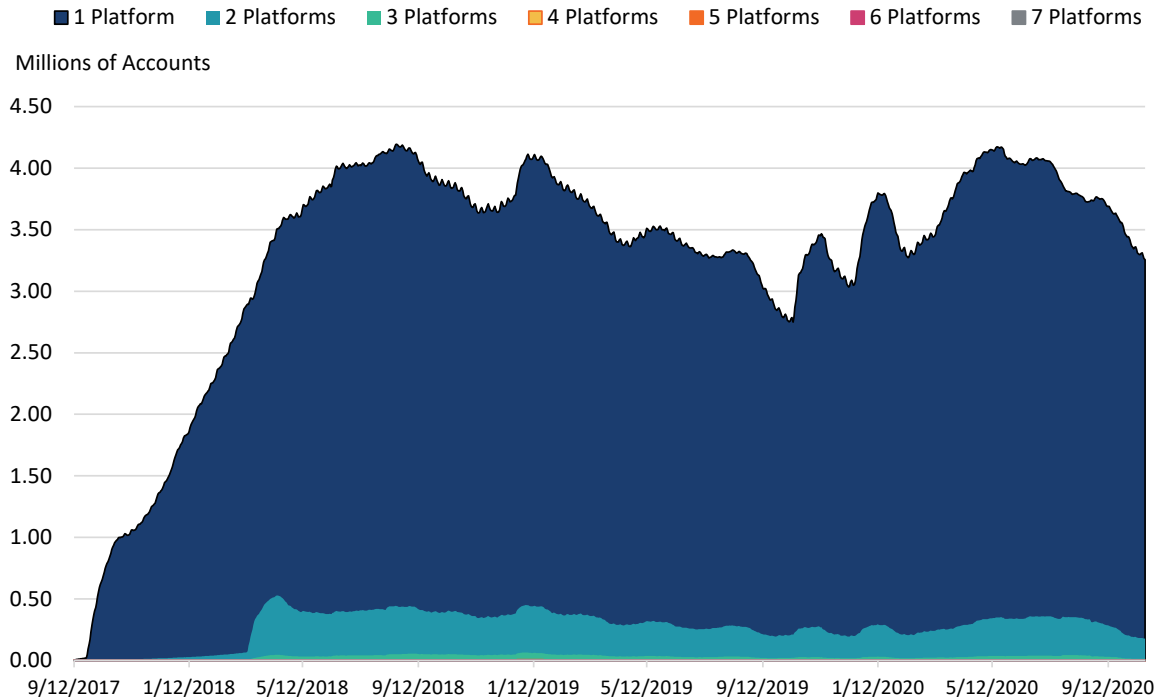
**FIGURE 13: PERCENT OF FORTNITE PLAYERS
WHO HAVE PLAYED ON EACH PLATFORM**

Platform	Percent of Users
iOS	41.10%
Android	6.32%
PlayStation 4	30.09%
Switch	10.48%
XboxOne	27.26%
Computer	18.98%

Source: PX-1034.

89. In addition, the Fortnite player base overwhelmingly spends time playing on only one device, despite the ubiquity of both PCs and smartphones. I show this in Figure 14 which shows the size of the Fortnite player base by the number of platforms on which users play per month. Users who own only one platform are locked-in to that platform. But even those users who own multiple platforms tend to play on only one platform – presumably their most preferred.

**FIGURE 14: MONTHLY ACTIVE USERS
BY PLATFORMS PLAYED ON PER MONTH**



Source: PX-1009.

90. Figure 15 shows the limited extent of multi-platform play among Fortnite users, even though Fortnite is a uniquely multi-platform-focused game, as discussed above. The table summarizes the number of users who have *ever* played on various combinations of platforms. However, the pertinent question for addressing substitution is the proportion of users that play on multiple platforms *during the same time period*, which is a considerably smaller proportion of the total player population than Table 15 shows.

FIGURE 15: PERCENT OF FORTNITE PLAYERS WHO HAVE PLAYED ON MULTIPLE PLATFORMS

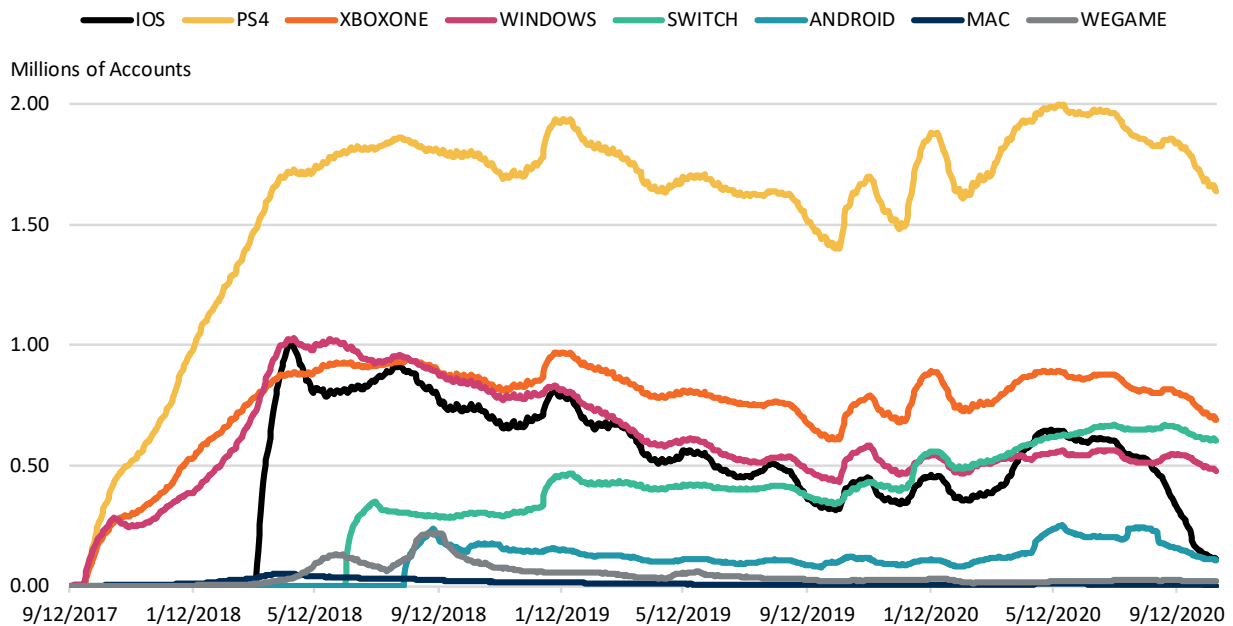
	iOS	Android	PlayStation 4	Switch	Xbox One	Computer
iOS	-	1.98%	8.10%	2.78%	6.69%	7.42%
Android	1.98%	-	2.05%	0.82%	1.57%	2.18%
PlayStation 4	8.10%	2.05%	-	1.62%	2.19%	5.07%
Switch	2.78%	0.82%	1.62%	-	1.66%	2.19%
Xbox One	6.69%	1.57%	2.19%	1.66%	-	4.10%
Computer	7.42%	2.18%	5.07%	2.19%	4.10%	-

Source: PX-1035.

91. By combining the results from Figure 13 and Figure 15, only roughly one quarter of Fortnite players who play on consoles (PlayStation, Switch, and Xbox One players) have at *any* point played Fortnite on iOS.¹⁴

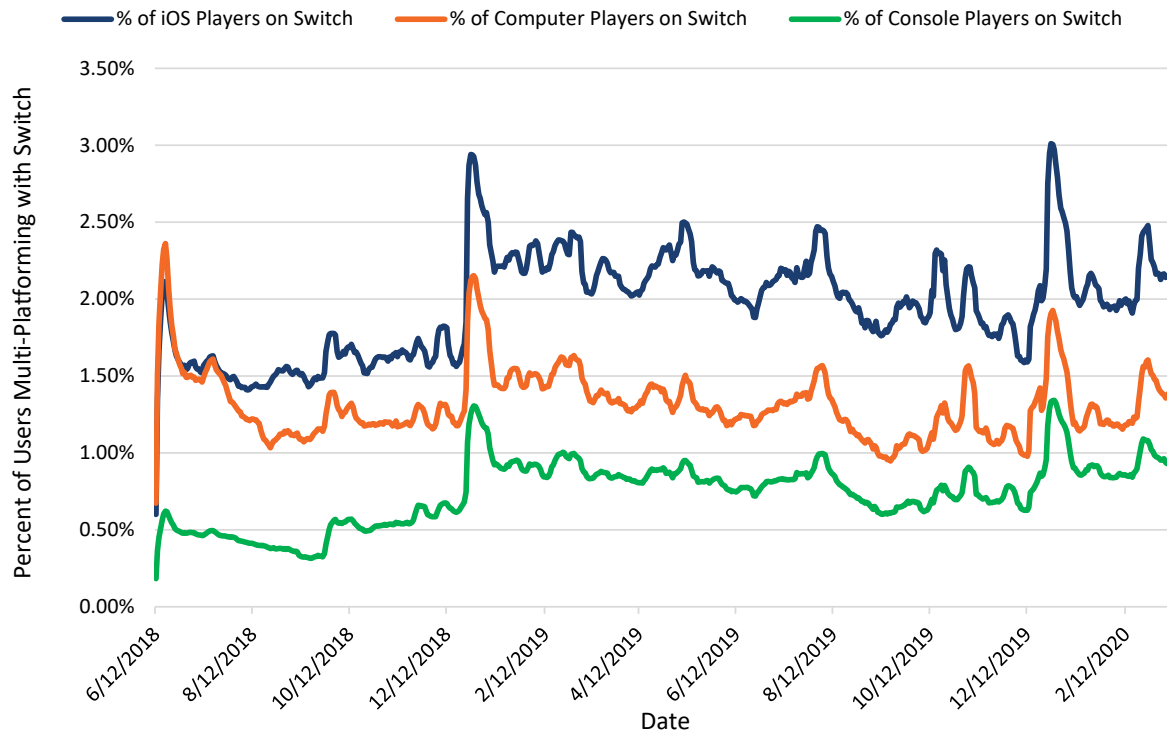
92. As Figure 13 showed, a larger fraction of Fortnite users have used iOS devices for Fortnite play than any other device. However, a graph of monthly active users shows that *consistent* play on iOS is less than on other devices (which have considerably smaller installed bases). This is further evidence that Fortnite mobile user play trends are different than Fortnite console user play trends, and that mobile play is a more casual form of Fortnite consumption than Fortnite play on console and PCs.

¹⁴ This can be seen by dividing the top row of Figure 15 by the percentages in Figure 13. For example, from Figure 13, 30.09% of users have played on the PlayStation 4, and from Figure 15, 8.10% of users have played on both the PlayStation 4 and iOS. This is 26.9% of all PlayStation 4 users (8.10% / 30.09%).

FIGURE 16: FORTNITE MONTHLY ACTIVE USERS BY PLATFORM

Source: PX-1010.

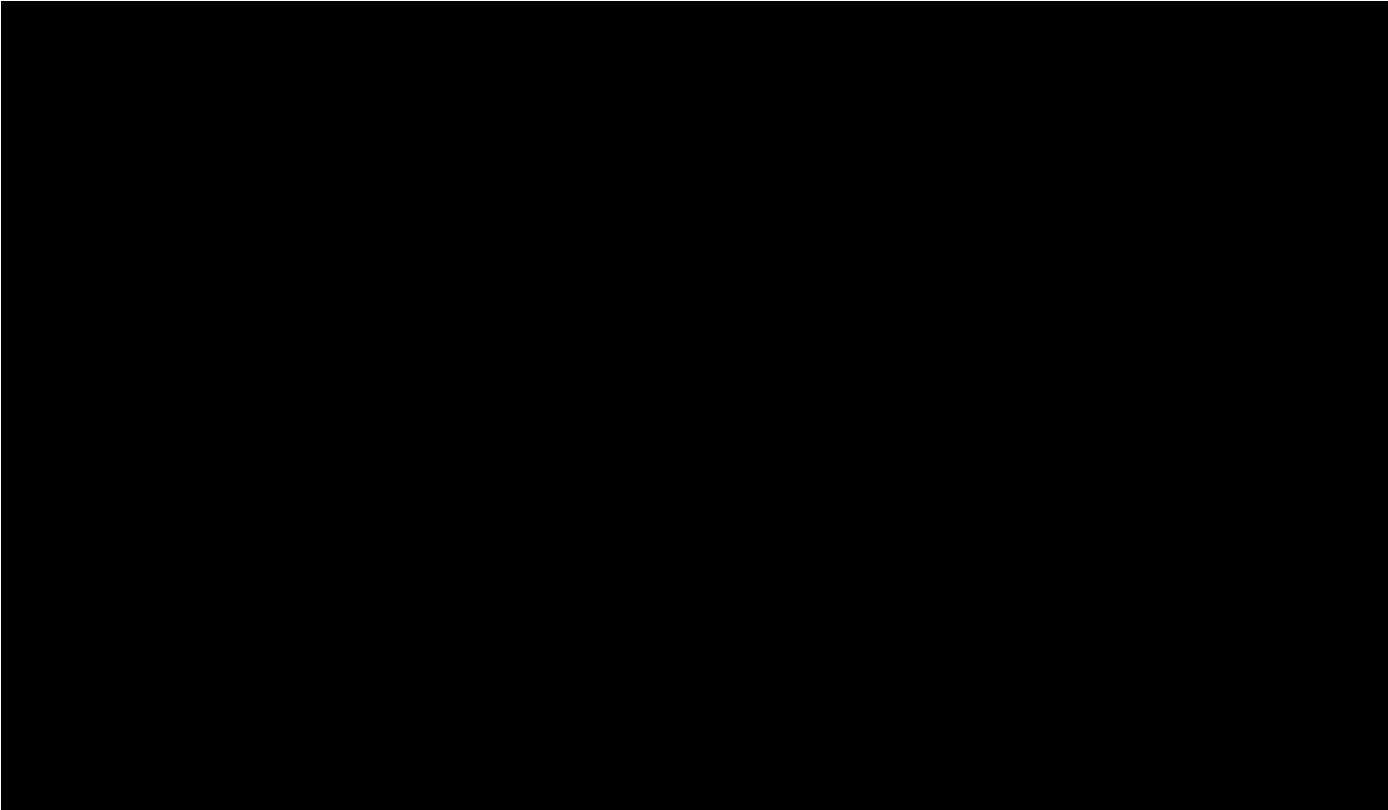
93. Finally, I considered the limited extent of multi-homing seen in Figure 17, focusing on the Switch. Specifically, I analyze the percent of Switch users who also play Fortnite on another platform in a given week. Figure 17 shows the results: the blue line shows the percentage of iOS users who also play on Switch, the orange line shows the percentage of PC users who also play on Switch, and the green line shows the percentage of console users who also play on Switch. As the figure shows, less than 3% of iOS users also play on Switch in any given week – i.e. 97% of iOS users in a given week do *not* play on Switch in the same week. The same is true to an even greater extent with console and PC users. This is further confirmatory evidence that, contrary to Prof. Hitt’s claims, the Switch is a poor substitute to Fortnite on a mobile device.

FIGURE 17: CROSS-PLATFORM WEEKLY ACTIVE USERS FOR FORTNITE ON SWITCH

Source: PX-1011.

E. Apple's Experts are Wrong to Claim that Developers Can Forego iOS Revenues in Sufficient Numbers to Put Competitive Pressure on Apple

94. Apple can afford to lose its business with any single app developer without a noticeable impact on App Store revenues because no one app accounts for much of Apple's revenue, as shown in Figure 18. However, for many app developers, losing access to iOS users would represent the loss of an enormous portion of a developer's revenue (if not all of it). In economics, Apple is therefore said to have considerable "bargaining power" over its app developers, because it stands to lose a lot less (relatively speaking) than any individual developer from a breakdown in the relationship resulting in the removal of an app from the App Store. Economic research has shown that firms with a high degree of bargaining power are able to dictate the terms of a contract to favor the firm with bargaining power. The onerous terms of Apple's Developer Guidelines, discussed below, are the sorts of contract terms that can emerge when such a large discrepancy in bargaining power exists.



95. In contrast to the small percentage of Apple's total App Store revenue that any one developer is responsible for, Apple makes up a large proportion of any single developer's revenues. In 2019, iOS users were responsible for an estimated 56% of all mobile revenues in the United States.¹⁵ The question of bargaining power among app developers is addressed further in Figure 19 below, which shows the total downloads for the most popular iOS apps, as well as the percentage of all downloads that these apps are responsible for. As I show, even well-known free apps, like Gmail, YouTube, and the Facebook app, represent a small fraction of the total apps downloaded on the Apple App Store, providing further evidence that bargaining power in app distribution lies in the hands of Apple, rather than the content providers themselves.

¹⁵ NewZoo, "2019 Global Mobile Market Report," available at <https://newzoo.com/insights/trend-reports/newzoo-global-mobile-market-report-2019-light-version/> (last accessed March 13, 2021), page 45.

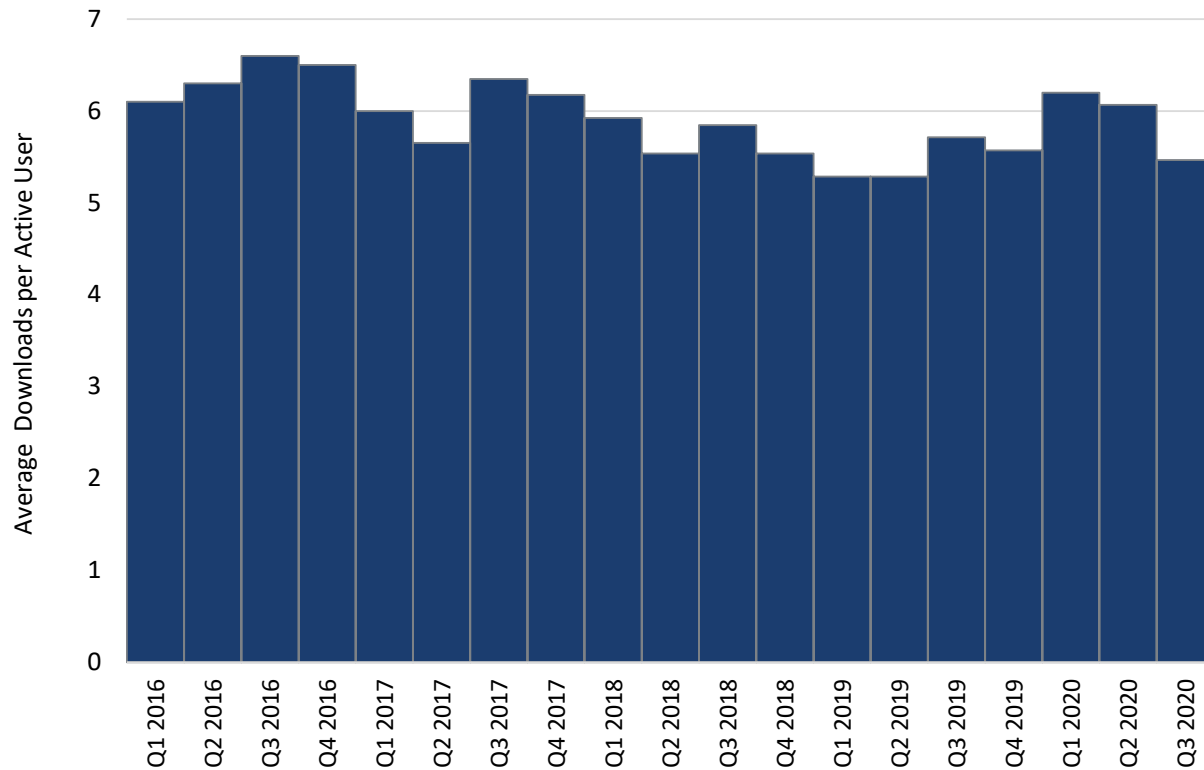
FIGURE 19: TOP 10 IOS APP DOWNLOADS AS A PERCENT OF ALL APP DOWNLOADS, 2019

App	Downloads	Percent of All Downloads
YouTube	33,612,575	0.47%
Instagram	27,589,597	0.39%
TikTok	27,092,363	0.38%
Messenger	26,444,265	0.37%
Gmail	25,630,102	0.36%
Netflix	25,237,391	0.36%
Google Maps	23,906,286	0.34%
Snapchat	23,650,029	0.33%
Facebook	23,004,917	0.33%
Amazon Shopping	20,475,013	0.29%

Source: PX-1037.

96. Alternatively, if iOS users relied heavily on a few unique apps, this could be an indication that app developers hold some degree of bargaining power with Apple, and may be able to credibly threaten to switch to a competing distribution platform that would act as a competitive constraint to Apple's App Store. Figure 20 shows that this is not the case. Rather than being restricted to only one or two apps, iOS users download a substantial number of apps, on the order of about 25 apps per year downloaded, per iOS device.

FIGURE 20: AVERAGE QUARTERLY DOWNLOADS PER ACTIVE IOS DEVICE, 2016-2020



Source: PX-1012.

V. Apple Has Significant Market Power and Prof. Hitt’s Analysis of Market Power is Incorrect

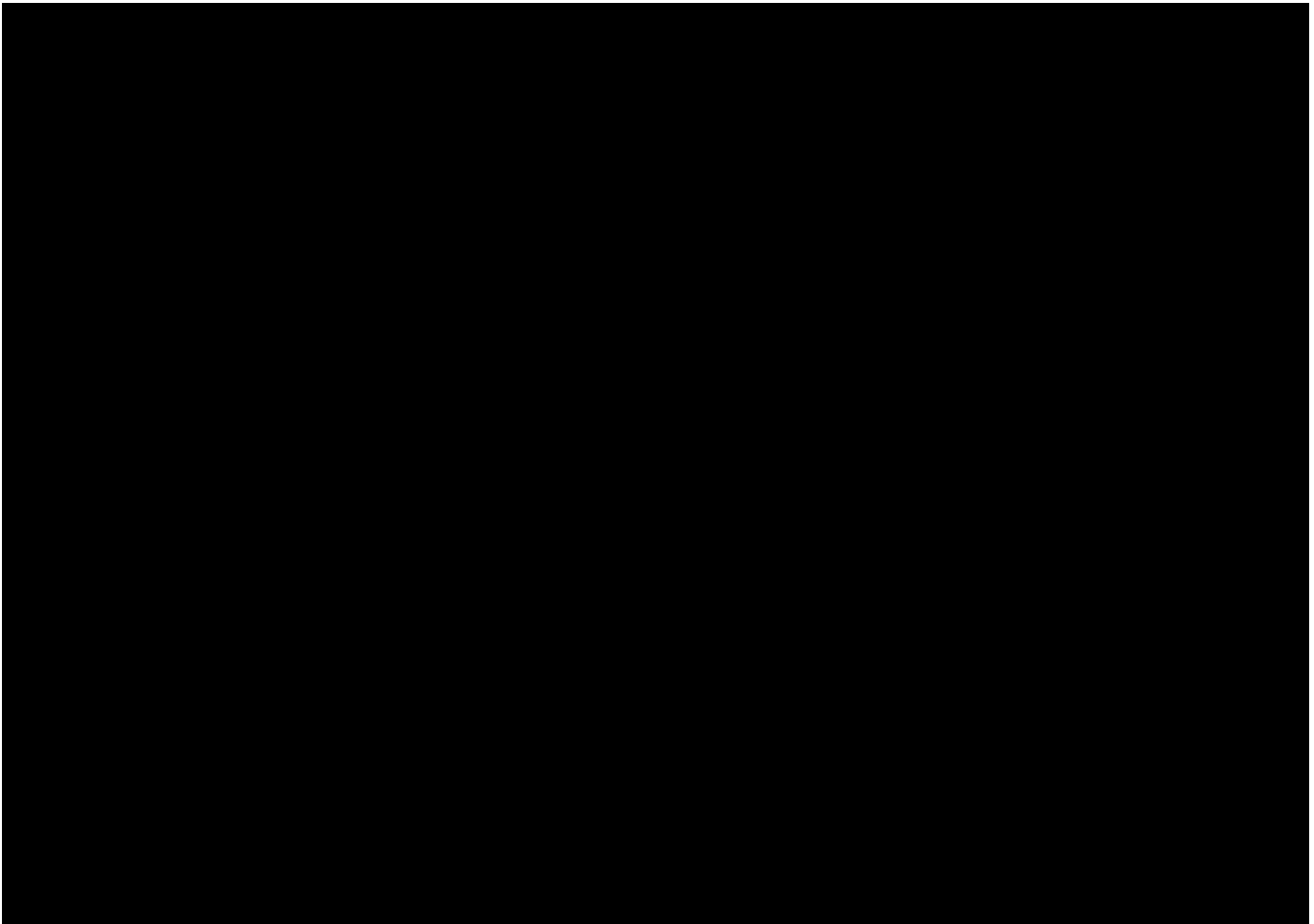
97. Prof. Hitt asserts that Apple’s commission rates have decreased over time, indicating that Apple does not have market power in the iOS app distribution market (Hitt, ¶¶9, 158-159). Prof. Hitt cites to three undisputed Apple policy changes that limited Apple’s commissions in certain instances,¹⁶ but then blends the modest effects of these changes with a shift to the “freemium” model into a single metric he describes as an “average commission rate” (Hitt, ¶¶170-174). In Figure 39, Prof. Hitt presents a precipitous decline in his constructed “average commission rate,” which, of course, is not the actual rate Apple imposes on paid

¹⁶ In 2016 Apple lowered its commission rate to 15 percent for subscription renewals after the first year; also in 2016, Apple lowered its commission rates to 15 percent for Amazon Prime and a few other video content providers, in what it ultimately announced (in 2020) as its Video Partner Program; and in early 2021, Apple lowered its commission rate to 15 percent for developers generating less than \$1 million in annual revenue.


transactions – *i.e.*, those that actually are subject to a commission – but for all transactions, which Prof. Hitt purports to calculate by ascribing a 0% commission rate to transactions that are not (and never were) subject to a commission (Hitt, ¶172).

98. As explained by Dr. Evans, Prof. Hitt’s analysis in Figure 39 is wrong because of its erroneous assumption of a 0% commission rate for free downloads – as a matter of simple arithmetic, there is no commission rate applicable to transactions where the developer does not charge the user anything (\$0/\$0 has an undefined value, not 0%). Moreover, Prof. Hitt’s analysis conflates a change in the *mix* of transactions with a change in the *price* of transactions. Specifically, in-app purchases of digital content remained subject to a 30% commission, and as shown by Dr. Evans, the modest changes that Apple did make to the price of in-app purchases of digital content (*i.e.*, the decrease in commission from 30% to 15% for a limited set of transactions) only lowered the average commission rate by less than 10% – from 30% to about 27.7%.

99. Importantly, while Apple’s actual commission *rates* remained largely unchanged, Apple’s average *commission per download* (in dollar terms) has dramatically *increased* over time. This is the actual dollar amount that Apple extracts from developers. Figure 21 shows that Apple’s average dollar commission for paid downloads in the U.S. over the life of the App Store has generally been *increasing* over time.



100. Likewise, Figure 22 summarizes Apple’s average commission per IAP transactions over the life of the App Store in actual dollars paid per transaction. As the figure shows, and in contrast to Prof. Hitt’s Figure 52, Apple’s per-transaction commission has increased [REDACTED] between 2009 and 2019 – at a time when, as Prof. Hitt notes, the number of such transactions increased significantly.



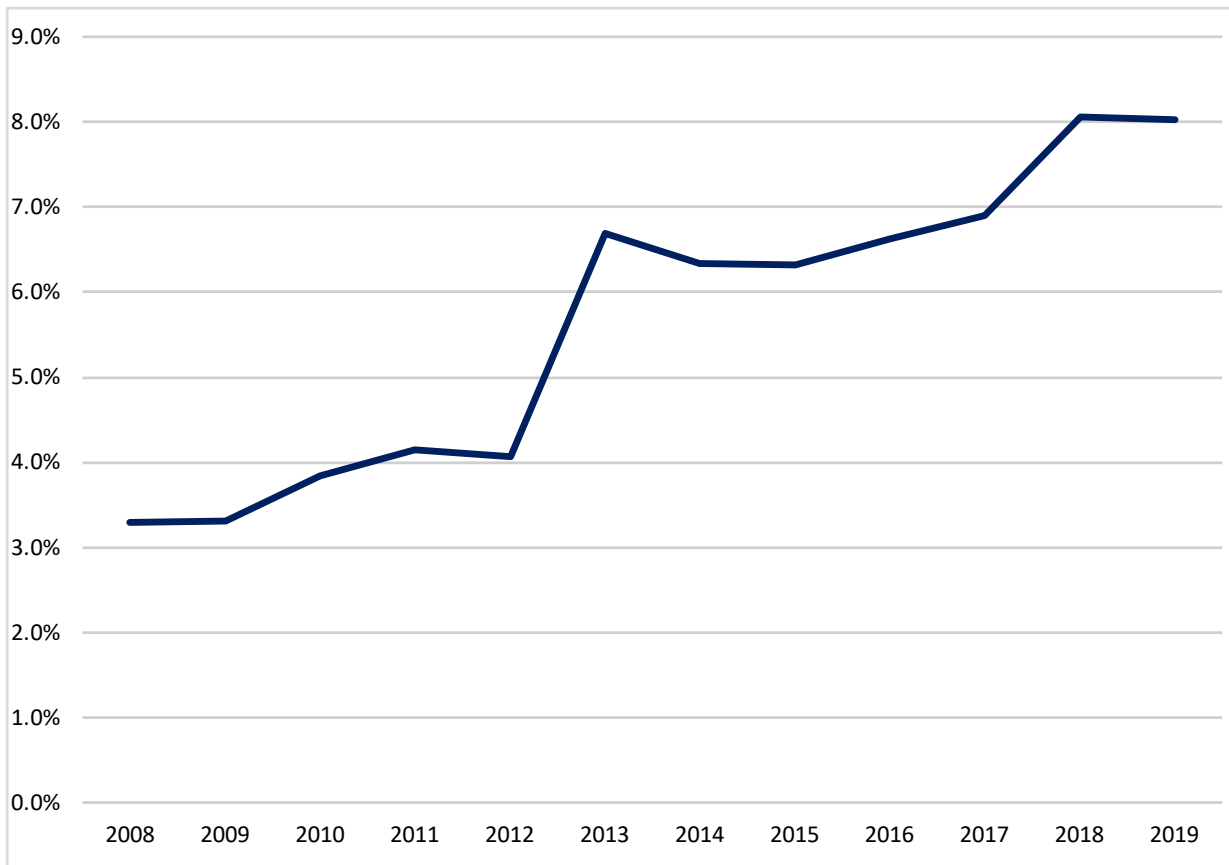
101. Prof. Hitt does not dispute this dramatic increase in the per-transaction fee Apple extracts from developers (Hitt, Figure 40). Instead, he claims this is the result of developers charging more for their in-app sales. But that is exactly the point: developers were able to charge more per in-app transaction presumably because they were able to offer apps and in-app products that offer increasing value to users. Apple, at the same time, offers largely the same (and in some respects a worse) product today as it did in 2008 – app distribution – yet collects on average five times as much *per transaction*. It is therefore wrong to suggest the pricing dynamic on the App Store suggests a lack of market power.

102. Importantly, the trend of ever-increasing per-transactions fees holds across Prof. Hitt's different calculations. Below, for example, I address the data underlying Prof. Hitt's Figure 55. In that figure, as explained above, when calculating the average commission rate across game transactions, Prof. Hitt incorrectly assumes that a \$0 commission on a \$0 transaction reflects a 0% commission rate. Prof. Hitt also improperly combined fees for downloads and fees for in-app purchases. Based on these improper assumptions, Prof. Hitt claims that the "effective games commission rate" [REDACTED] Figure 23, below graphs the average per-transaction fee that Apple charges across a combination of paid downloads and in-app purchases and shows that, even under Prof. Hitt's improper assumptions, the per-transaction fee charged by Apple has *still* increased substantially between 2009 and 2019, [REDACTED]

[REDACTED]

[REDACTED]

103. Next, continuing to accept Prof. Hitt’s questionable methodology of combining different transaction types, his own methodology shows Apple’s commission *rate* per game transaction more than doubling over the history of the iOS App Store. Figure 24, which includes both game app downloads and IAP, shows Apple’s commission rate across transactions increasing from roughly 3% to 8%. This is in contrast to Prof. Hitt’s Figure 39, which shows a decreasing commission rate for initial downloads, and his statements that Apple has kept constant or reduced in-app purchase commissions (Hitt, ¶269). The figure below is more informative than Prof. Hitt’s Figure 39 because it takes account of the shifting business models Prof. Hitt presents in Figure 38 but does not control for. Moreover, the evolution from paid apps to IAP puts Prof. Hitt’s Figure 55 in context and shows the FY2019 “Game App Effective Games Commission Rate” of 8.1% is double what it was in FY2009, consistent with increasing prices.

FIGURE 24: AVERAGE COMMISSION RATE FOR GAME APP TRANSACTIONS

Source: Apple Transaction Data.

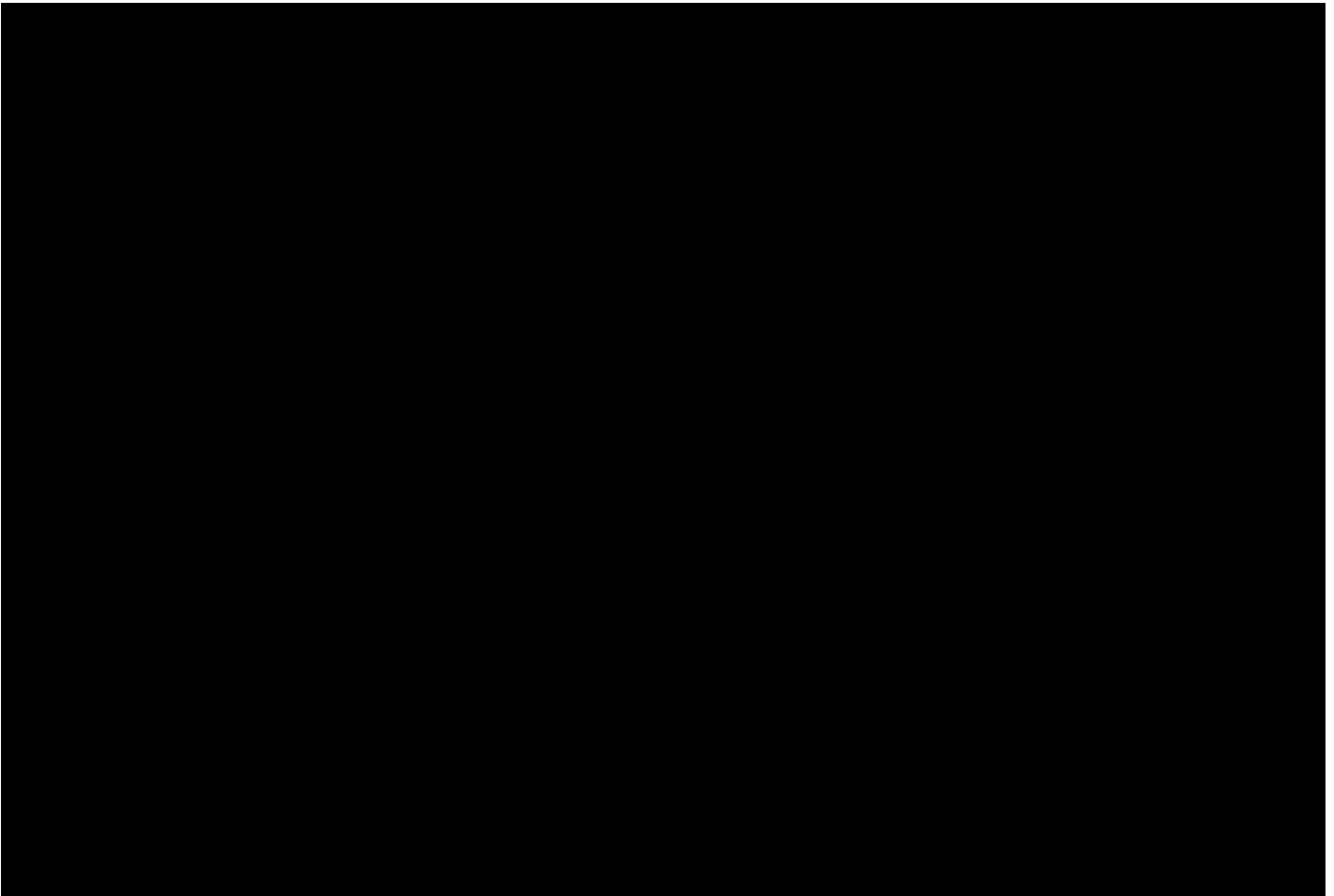
104. Apple’s ability to increase the prices is further evidenced by the fact that, in one important respect, the product that Apple provides to developers in exchange for the commissions it collects has become materially worse, and costlier, over time. Prior to 2016, developers competed for the top spots on users’ App Store search results page based on app popularity or relevance to the user’s search. Starting in 2016, however, Apple began implementing sponsored ads on its App Store, forcing developers to compete for the top spot by paying Apple for specific search terms. If a user searches for an app in the iOS app store using that particular term, the developer’s app will appear at the top of the user’s search results. Bids are paid on a “cost-per-tap” (“CPT”) basis. Every time a user taps on a sponsored ad, Apple bills the developer, regardless of whether or not the user installs the app. As a result, even developers of apps with unique names – such as Fortnite, Spotify, or Netflix – must pay Apple to ensure that their apps are returned as the top result for app-specific queries.

105. As a percent of average app and in-app purchase prices, CPT payments are substantial. In 2018, for example, users paid an average of \$1.99 to download a paid app. The average CPT during this period was \$0.92, or 46% of the average app price. Some particularly

coveted search terms auction for a much higher price, with developers paying up to \$4.16 per tap for search terms related to sports apps.

106. Apple has recently expanded App Store advertising, introducing new sponsored ads on the app search screen prior to a user even entering any search terms. Thus, rather than only seeing ads on the search results screen, users running the latest version of iOS now see sponsored ads even before entering a search term.

107. Taking into account this additional revenue stream that Apple now collects from developers through advertising, Figure 25 shows that Apple's share of App Store revenues, including paid downloads, in-app purchases, subscriptions and sponsored ads, is materially *rising* (not falling), despite developers' shifting to the freemium business model and the reduction in some commissions on some limited transaction types.



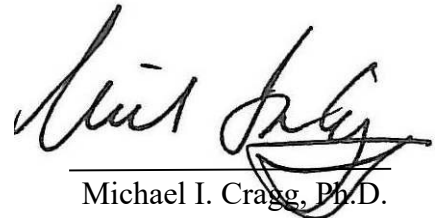
108. Taken together, the five figures above lead to the same conclusion: Apple has used its bargaining power and monopoly power to extract increasingly more money from developers (and indirectly from users) through the App Store, whether measured as a total percentage of App Store revenues, or measured on a per-transaction basis.

109. Lastly, Prof. Hitt compares the revenue per hour of game play for Fortnite users by platform, showing that iOS users spend the most per hour of game play (Hitt, Figure 49, ¶196). He concludes that this is evidence that Apple has not “reduced quality” of the App Store, though he provides no explanation as to why this is an indication of Apple’s App Store quality (Hitt, ¶197). It is not. The reason iOS users spend more, which is well documented in industry commentary,¹⁷ is that Apple mobile devices are expensive, and thus Apple’s consumers are likely to have more disposable income than the general population, and likely to spend more; this is known as the “income effect” in economics. Thus, it is no surprise that iOS users spend more than other Fortnite players, and that the App Store, in general, generates higher revenues than the Google Play Store that runs on many more lower-cost devices.

* * *

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct and that I executed this written direct testimony on April 27, 2021, in Belmont, MA.

WORD COUNT: 14,135



Michael I. Cragg, Ph.D.

¹⁷ Bhardwaj, P. and Gal, S. “Despite Android's growing market share, Apple users continue to spend twice as much money on apps as Android users,” Business Insider, July 6, 2018, available at <https://www.businessinsider.com/apple-users-spend-twice-apps-vs-android-charts-2018-7> (last accessed April 27, 2021).